

February 14, 2011

MORGAN STANLEY BLUE PAPER



Tablet Demand and Disruption

Mobile Users Come of Age

Tablet demand is still underappreciated: shipments could reach 100 million by 2012, in our bull case scenario. A series of proprietary surveys covering more than 8,000 consumers and 50 chief information officers suggest that tablets are accelerating the adoption of the mobile internet. Our data yielded several surprises: 1) two-thirds of companies expect to allow tablets on their networks within a year; 2) consumer interest in tablets is even greater outside of the US, and 3) users are moving beyond web surfing, email, games, video, and applications to content creation. Tablets are additive to the broader computing market, and we see more beneficiaries than challenged companies.

Tablet disruption is not yet discounted by the market in many industries. Tablets should reduce PC market growth by 3 percentage points in 2011—maybe more over the long term. Like smartphones, tablet growth is likely to benefit the established leaders while challenging legacy technology. The impact on printing companies may be the most underappreciated cannibalization story, and we highlight AMD, Dell, Lexmark, and Ricoh as potentially challenged from tablets.

Market share leaders and “arms dealers” are the best way to play the bull case. Apple and Samsung Electronics are the most probable tablet beneficiaries, with tablets core to the investment thesis. ARM Holdings, Broadcom, and SanDisk help provide users with fast, touch-enabled, and power-efficient mobile devices and should enjoy greater scale if tablet growth surprises to the upside. Medium term, there are opportunities for software companies in applications, management, and security. Tablets' impact on Wintel players Hewlett-Packard, Intel, and Microsoft has largely been discounted, and earnings risk appears limited, partially due to diversification.

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February 14, 2011
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See page 88 for recent Blue Paper reports.

Table of Contents

Executive Summary	4
Key Investment Conclusions	5
Summary of Key Takeaways by Industry	6
The New Computing Landscape	7
Why We're Bullish.....	7
Key Tablet Assumptions: Shipments and Cannibalization.....	12
State of the Tablet Market	14
Hardware: Cannibalization Challenges PC Vendors	19
Semiconductors: ARM Wins Round One in Tablet CPUs	28
Hard Disk Drives: Tablets Not Too Disruptive, Other Threats Linger	38
Memory Semiconductors: NAND Is Best Bull Case Play	42
TFT-LCD and Touch Panels: Some Positives for Display Technology	46
Imaging and Printing: Tablets to Reduce Printing Demand	50
Software: Opportunities in Management, Applications and Security	55
Interactive Entertainment: Tablets Poised to Cannibalize Hardware	65
Cable/Satellite: Tablets Unlikely to Drive Incremental Cord-Cutting	73
Media: A Game Changer for Content Owners	77
Appendix I: Key Survey Takeaways	81
Appendix II: US Tablet Survey Demographics	84
Appendix III: Models	85
Appendix IV: Summary of Tablet Offerings	87

February 14, 2011
Tablet Demand and Disruption

Executive Summary

The mobile internet user first appeared only a few years ago, but already this new user's behavior is changing the technology landscape. We believe that we are in the early innings of the mobile computing cycle – the largest in the history of computing. By the end of 2020, we predict that 10 billion mobile internet devices will be in use, up from 2 billion today. Within this larger trend, we are seeing a fragmentation of computing devices, and 2011 may be the year of the tablet – a computing product whose adoption, we expect, will ramp faster than any previous mobile device (exhibit 1).

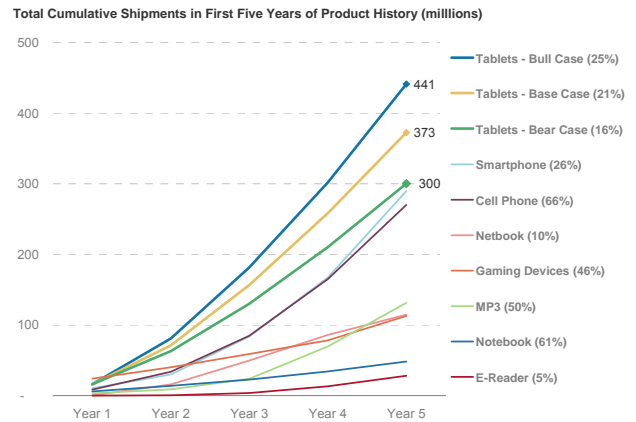
Through the aggregating of data from more than 8,000 global consumers and 50 US CIOs, we have garnered unique insights into the tablet market and usage patterns of tablet users. Our data include AlphaWise consumer surveys performed in the US, UK, France, Germany, Japan, and China in October 2010. Based on these surveys, we believe that the tablet market could be bigger and more disruptive than investors appreciate. In particular, three potential upside surprises highlighted by our research could boost 2012 tablet shipments to our 100-million bull-case scenario:

First, enterprise adoption could be more widespread than expected. Two-thirds of the 50 CIOs in our January 2011 survey expect either to purchase tablets for some of their employees or allow employee-owned tablets onto their networks within one year – up from 29% currently (exhibit 2). While it is difficult to know how large the deployments will be, what the use cases are for the tablet deployments, and how they might affect corporate PC expenditure, this is some of the first-hand evidence we have of enterprise tablet adoption. Any meaningful uptake of tablets in the enterprise opens up opportunities for application, security, virtualization, and management software vendors.

Second, international demand could be materially higher than some expect. While consensus views the tablet market as largely a US consumer phenomenon, the international consumer survey data surprised us. Demand came in higher than in the US in every large developed international market – the UK, Germany, France, Japan – and significantly higher in China (exhibit 3). While we base our current tablet shipment forecast on data from US consumers, there appears to be a clear upward demand bias in international markets.

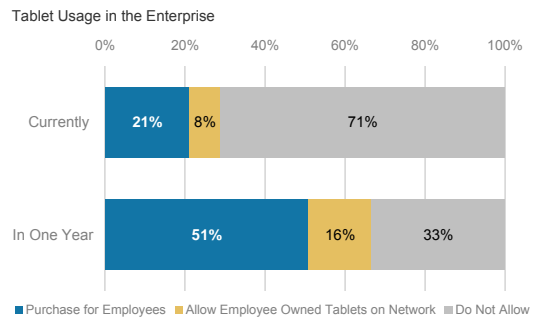
Third, increasingly, tablets may be viewed as content-creation devices. Today, the primary use of tablets is to consume content through activities like web browsing, social networking, and watching video. However, 20% of tablet owners also use the device to create or edit files regularly. While this figure is below the 34% of netbook owners and 56% of notebook owners that regularly use these devices to create or edit files, we believe the rate of introduction of new mobile applications and faster processors could increase these figures over time.

Exhibit 1
Tablets: The Fastest Ramping Mobile Device...



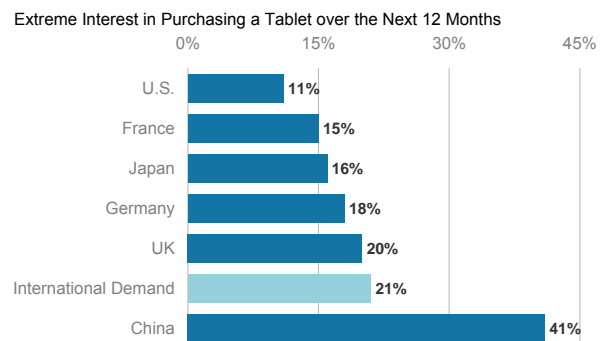
Note: Percentages represent current penetration rates for each device. Figures for bull, base, and bear case forecasts represent penetration rate in year five. For notebook, cell phones, and gaming devices, shipments are in early years of product history. Source: Morgan Stanley Research, Gartner, IDC, company reports

Exhibit 2
...Being Adopted in 2/3 of Companies in 2011...



Source: AlphaWiseSM CIO survey

Exhibit 3
...With Demand Even Stronger Outside the US



Source: Morgan Stanley Research, AlphaWiseSM

February 14, 2011
Tablet Demand and Disruption

Key Investment Conclusions

As a global technology, media and telecommunications equipment team, we investigated the investment debates for tablets across 10 industries, both within the tablet supply chain and adjacent industries, and now present our conclusions in this Blue Paper. In some cases our conclusions are clear and conviction is high. In other cases, admittedly, our team members themselves hold differing opinions. Because we are only in year two of what we think will be a 10-year technology shift, we expect that it will take time to build consensus. Below we highlight our key investment conclusions (exhibit 4).

Like smartphones over the past two years, tablet growth is likely to surprise to the upside, in our view, pulling with it market leaders and challenging legacy technology. Importantly, while some tablets will eat into other markets, like PCs, e-readers, and gaming handhelds, more than half of prospective tablet buyers in the US and more than one-third globally view a tablet as an additive device—a bullish signal for the broader technology market. We view Apple and Samsung Electronics as the most likely near-term tablet market leaders in both our base- and bull-case scenarios.

Memory-based storage is the best way to play the bull case. We view component vendors as the “arms dealers” that support tablet growth, and memory-based storage (NAND) is the most likely beneficiary if our bull case scenario plays out. SanDisk is best positioned here, with 60% earnings exposure to memory in mobile devices. We also see upside to ARM Holdings, in light of its leadership position in low-power-usage processors, and Broadcom, a provider of connectivity and touch controller semiconductors.

The impact of tablets on pages printed is the most underappreciated cannibalization story. CIOs in the enterprise space already expect to cut spending on printer supplies in 2011. As the installed base of tablets—a digital document viewer that reduces the need to print both standard black and white documents and expensive color presentations—grows, we expect printed page volumes to

shrink. What’s more, 90% of iPad users already believe they would print less with access to work documents on their tablets. Given high earnings exposure to sales of printers and related supplies, we highlight Lexmark and Ricoh as potentially challenged due to rising tablet adoption.

Large-cap technology stocks face limited earnings risk. Large-cap tech stocks bore the brunt of tablet-related valuation compression over the last year. Even so, they face relatively small earnings risk because of their more diversified business models. In our base case, we see less than \$0.05 of EPS downside for large-cap technology stocks like Hewlett-Packard, Intel, and Microsoft. While these companies need to more effectively communicate their strategy and execute on tablets, they are somewhat protected by the greater diversity of their businesses. We see more downside for companies with higher earnings exposure to PCs and printers.

Please see page 6 for a summary of key takeaways by industry.

Exhibit 4

Best Ways to Play Tablet Adoption

Best Positioned - Overweights			
Company	Ticker	P/E	Comments
Apple	AAPL.O	15.9	Tablet leader
ARM Holdings	ARM.L	50.5	Processor leader
Broadcom	BRCM.O	13.8	Connectivity leader
Samsung	005930.KS	8.9	Tablet leader / supplier
SanDisk	SNDK.O	10.3	Memory leader
Challenged - Underweights			
Company	Ticker	P/E	Comments
Advanced Micro Devices	AMD.N	17.5	PC exposure
Dell	DELL.O	10.1	PC exposure
Lexmark	LXK.N	10.3	Printer exposure
Ricoh	7752.T	17.8	Printer exposure

Note: P/E as of February 10, 2011. Samsung refers to Samsung Electronics.
Source: Morgan Stanley Research

February 14, 2011

Tablet Demand and Disruption

Summary of Key Takeaways by Industry

<p>Hardware</p> 	<p>Tablets are disruptive to the PC market, reducing units by 5%, on average, through 2013.</p> <ul style="list-style-type: none"> • Tablets increase the TAM, but traditional PC vendors will likely struggle to capture incremental demand. • Smartphone vendors better positioned, particularly those that own a platform. • Best positioned: Apple, Samsung Electronics, Motorola Mobility, HTC, Research in Motion, Hon Hai Precision. Potentially challenged: Hewlett-Packard, Dell, Acer, Asustek Computer, Lenovo, Toshiba, Sony.
<p>Semiconductors</p> 	<p>Tablets are the latest x86 versus ARM battleground – ARM wins round one.</p> <ul style="list-style-type: none"> • Near term, ARM should continue to dominate as OEMs prioritize low power consumption over performance. • Longer term, success depends on: 1) usage model 2) manufacturing muscle and 3) Windows 8 success. • Tablets are accretive to most semi companies; EPS risk for Intel and AMD is 1% and 4%, respectively. • Best positioned: ARM Holdings, Broadcom, Qualcomm, Nvidia, Texas Instruments, Marvell Technology Group. Potentially challenged: Advanced Micro Devices, Intel.
<p>HDD</p> 	<p>Surprisingly, tablets are not too disruptive to the hard disk drive market but other important threats linger.</p> <ul style="list-style-type: none"> • Tablets reduce HDD shipments by 2-3%, on average, through 2013 in our base case. • Shift to centralized storage only provides a modest offset to tablet cannibalization. • Other threats include desktop virtualization, PC solid-state drives and cloud streaming services. • Potentially challenged: Western Digital, Seagate, TDK, Nidec.
<p>Memory</p> 	<p>NAND is the best way to play the tablet bull case.</p> <ul style="list-style-type: none"> • NAND market remains tight due to rising adoption of tablets and smartphones. • Tablet bull case could disrupt the NAND supply demand balance, leading to supply constraints. • DRAM impact is only a slight negative in the near term but neutral to additive by 2012. • Best positioned: Samsung Electronics, Toshiba, SanDisk.
<p>TFT-LCD</p> 	<p>High-end displays and touch panels are strategic components and clear tablet beneficiaries.</p> <ul style="list-style-type: none"> • Tablets are driving a meaningful expansion in the touch panel market. • While the overall TFT-LCD industry impact is modest, providers of high-end displays will benefit. • Best positioned: Young Fast, Chimei Innolux.
<p>Printing</p> 	<p>Tablet impact on pages printed is the most underappreciated cannibalization story.</p> <ul style="list-style-type: none"> • Printing behavior is structurally changing; we expect a reduction in enterprise and commercial printing. • The majority of iPad owners are printing less in the office and many are cancelling print subscriptions. • We expect a 2-5% reduction in printer supplies revenue in developed markets by 2012. • Potentially challenged: Lexmark, Hewlett-Packard, Ricoh.
<p>Software</p> 	<p>Opportunities in management, applications and security; near-term Microsoft impact limited.</p> <ul style="list-style-type: none"> • We only see a \$0.02-0.03 EPS impact while Microsoft calibrates tablet strategy with Windows 8 in 2012. • Tablets offer opportunities for systems management, applications and security software vendors. • Best positioned: VMware, Citrix Systems, Intuit, SuccessFactors, Salesforce.com. Potentially challenged: Microsoft, Adobe.
<p>Gaming</p> 	<p>Tablets poised to cannibalize gaming hardware.</p> <ul style="list-style-type: none"> • Tablets could reduce gaming hardware shipments by 6-8% over the next two years. • While cannibalization will focus on the handheld market, product cycles could reduce near term pressure. • Tablets provide a new gaming software platform but is offset by cannibalization and lower pricing. • Potentially challenged: Nintendo, Sony.
<p>Cable/Satellite</p> 	<p>Enhanced video experience and rising broadband consumption.</p> <ul style="list-style-type: none"> • Tablets offer a platform to improve video search and navigation, benefitting cable and satellite. • Rising broadband consumption in the home driven by tablets will benefit cable.
<p>Media</p> 	<p>A game changer for content owners.</p> <ul style="list-style-type: none"> • Larger audience creates additional advertising opportunities for TV networks. • Potential to drive incremental rental activity for movie studios. • Ability to recreate a true layout with interactive content offers opportunity for magazines.

February 14, 2011
Tablet Demand and Disruption

The New Computing Landscape

Why We're Bullish

Our bullish view on tablet adoption is primarily based on three factors: 1) tablet usage and demand data from our AlphaWise consumer survey, 2) our broader view on the computing cycle, and 3) the enterprise opportunity. In this section, we will discuss each of these factors in turn.

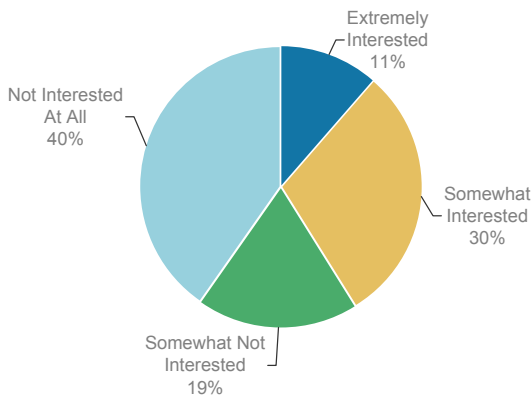
Consumers show strong intentions to purchase a tablet.

Fundamentally, we see a strong level of tablet purchase intentions from our AlphaWise consumer survey. By the numbers, 11% of consumers are extremely interested in purchasing a tablet computer over the next year and 30% are somewhat interested (exhibit 5).

Exhibit 5

AlphaWise Survey Points to Strong Tablet Purchase Intentions...

Tablet Purchase Intentions over the next 12 months, U.S.



Source: AlphaWiseSM, Morgan Stanley Research

Of all our surveys, interest in tablets is the highest. To put these numbers into context, extreme interest in purchasing a tablet computer is higher than in any survey we have completed over the last three years and 2.5 times higher than tablet purchase intentions in March 2010. What's more, extreme interest in purchasing a tablet is 1.5 times higher than iPhone purchase intentions indicated by our March 2010 survey (exhibit 6), and Apple is on track to sell 47 million units in the 12 months following the survey.

Key Tablet and PC Assumptions

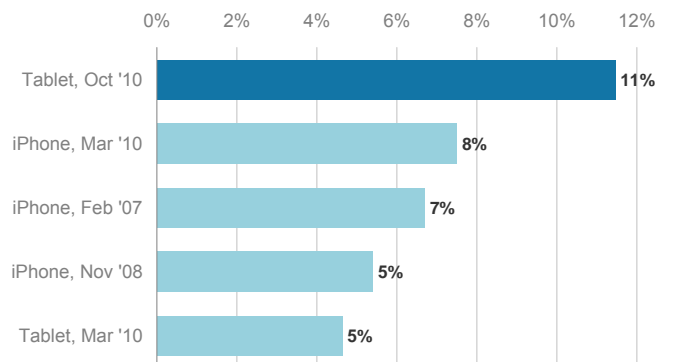
	2009	2010	2011	2012	2013
Shipments (millions)					
Desktops	136	146	152	157	159
Notebooks	135	164	189	210	232
Netbooks	34	36	29	26	27
Tablets	-	16	55	85	102
Total	305	362	425	478	519
PCs, gross					
PCs, gross	305	351	386	416	439
Tablet Cannibalization	-	(5)	(16)	(23)	(21)
PCs, net	305	346	370	393	417
Tablets	-	16	55	85	102
Total	305	362	425	478	519
YoY Growth					
Desktops	-10%	7%	5%	3%	1%
Notebooks	6%	22%	15%	11%	10%
Netbooks	118%	8%	-20%	-11%	5%
Tablets	-	-	245%	54%	20%
Total	4%	19%	17%	12%	9%
PCs, gross					
PCs, gross	4%	15%	10%	8%	6%
PCs, net					
PCs, net	4%	14%	7%	6%	6%
Cannibalization Rate					
Cannibalization Rate	-	30%	29%	27%	21%

Source: Morgan Stanley Research, IDC

Exhibit 6

...Especially Relative to Past AlphaWise Surveys

Comparison of Extreme Interest Purchase Intentions



Source: AlphaWiseSM, Morgan Stanley Research

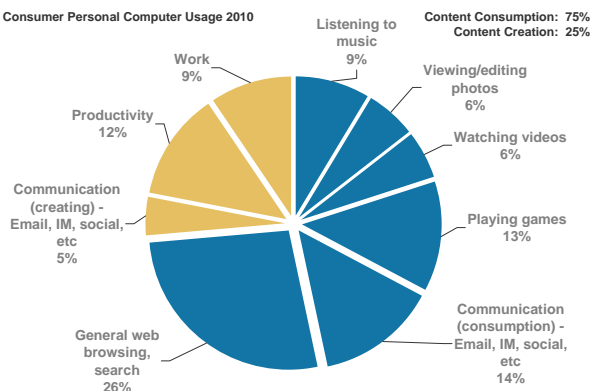
February 14, 2011
Tablet Demand and Disruption

Tablets do not necessarily replace other technology purchases. Many consumers view tablets as an incremental device—a bullish indicator for the broader technology landscape. Fifty-five percent of potential tablet users do not expect a tablet to replace the purchase of another technology product, indicating an expansion in the market size of mobile devices that should benefit tablet vendors, component suppliers, and content providers alike.

Tablets signal a change in PC usage. Our analysis of personal computing usage suggests that computing will increasingly migrate towards mobile devices, including tablets and smartphones, over time. Approximately 75% of total personal computer usage is spent consuming and sharing content, as opposed to creating content (exhibit 7).

Consuming content includes activities like browsing the web, social networking, listening to music, viewing pictures, and watching video. Content creation includes activities such as word processing, creating spreadsheets, and photo editing. Given this typical usage pattern, we think consumers will increasingly migrate towards computing devices such as tablets that are optimized for content consumption.

Exhibit 7
PCs Usage Is 75% Content Consumption/Sharing

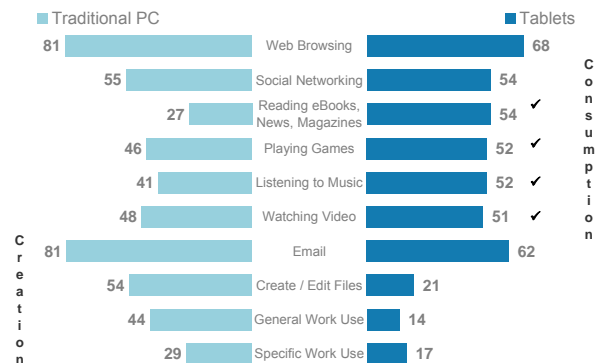


Source: AlphaWiseSM, Morgan Stanley Research

Tablets are optimized for content consumption. Mobility and ubiquitous connectivity mean that you can take a tablet virtually anywhere and have access to personal content and the web. High-resolution displays are ideal for web browsing, email, watching video, and reading books, magazines, and newspapers. Long battery life, thanks to operating system and processor innovation, means that one can consume content all day on a single charge (on the iPad, for instance). Content is robust, offering a considerable selection of music, movies, TV shows, books, and magazines that can be accessed with the click of a button. Application marketplaces offer a wide array of options that significantly enhance the tablet computing experience beyond traditional desktop computing.

Considerable usage overlap between PCs and tablets. Data from our AlphaWise survey point to considerable usage overlap, particularly for content-consumption activities (exhibit 8). This suggests that tablets will likely take computing share from traditional PCs. In fact, in several key content-consumption categories, like listening to music, watching videos, playing games, and reading, tablets actually are used more than traditional PCs.

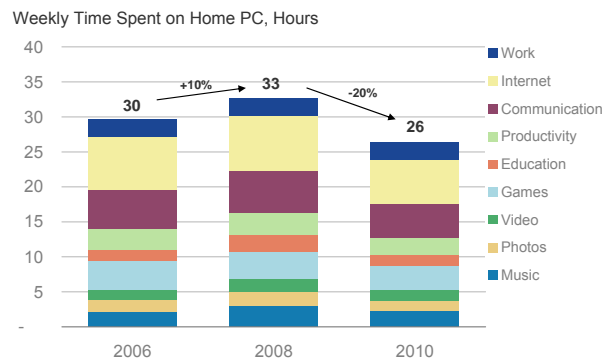
Exhibit 8
Tablets Geared Towards Content Consumption



Note: Traditional PC is average of desktop and notebook. Represents percentage of users who use the device regularly for each activity.
Source: AlphaWiseSM, Morgan Stanley Research

Tablet users are spending less time on existing PCs. Particularly for content-consumption and content-sharing activities such as browsing, email, and social networking, 30% of tablet owners are reporting reductions in time spent on existing PCs. Indeed, our analysis of total time spent on PCs (tablet owners and non-tablet owners) suggests that consumers are spending 20% less time on traditional PCs in 2010 as compared to 2008, likely due to the rising adoption of mobile computing devices such as tablets and smartphones (exhibit 9).

Exhibit 9
Consumer PC Usage Is Down 20% Since 2008

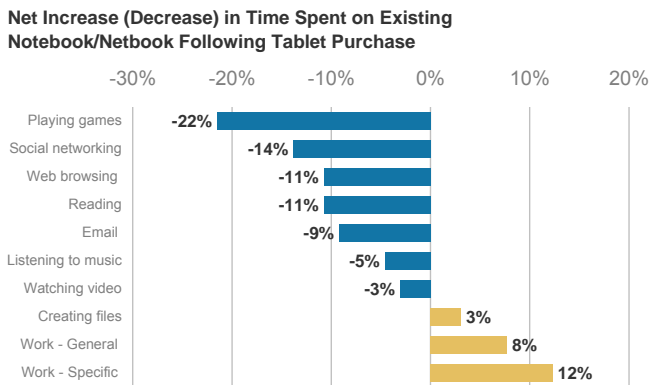


Source: Forrester, AlphaWiseSM, Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

What about the rest of the time? As we discuss in the cannibalization section below, our research suggests that most tablet purchases will not replace PCs in the near term, and this is partially due to the content-creation requirements of many consumers. Not surprisingly, content-creation usage is much lower on tablets than on traditional PCs, as our analysis of AlphaWise usage data suggests. In fact, tablet usage appears to be driving reductions in time spent on PCs for several key content-consumption activities, but not for content-creation tasks (exhibit 10).

Exhibit 10
Tablet Usage Overlap Driving PC Usage Declines in Content Consumption, Not Content Creation



Source: AlphaWiseSM, Morgan Stanley Research

The lack of support for the Microsoft Office suite on both iOS and Android, combined with the lack of a physical keyboard on many tablets, will lead many consumers to require a traditional PC irrespective of a tablet purchase, particularly those who require productivity software for out-of-the-office work. Windows 7-based tablets, especially tablet hybrids with a keyboard, solve this problem but introduce a variety of other problems that we discuss in the software section of the report. Additionally, Windows 7 is not optimized for tablets, so touch is still not elegant—nor are most Windows-based applications optimized for tablets.

While we do not think that tablets can match the content-creation experience of traditional PCs, we believe that mobile-productivity or web-based-productivity applications, combined with a keyboard, enable basic content-creation functionality that is sufficient for many users. While tablet usage is still well below traditional PC usage for content-creation, our survey does suggest that some tablet users are using their tablets to create content, and we expect this figure to rise over time. Overall, we view tablets as being additive to the total computing market and expect to see more beneficiaries than challenged companies from tablet growth.

alphawise Evidence

Core Questions for Evidence Research

- *What are consumer's tablet purchase intentions?*
- *How will tablet purchases impact PC, eReader and gaming hardware spending?*
- *How are consumers using PCs, smartphones and tablets?*
- *How will tablets impact PC usage?*

What Gives Us Confidence

- *We surveyed 8,203 consumers across the US, UK, France, Germany, China, and Japan in October 2010.*
- *The U.S. sample is representative of the online adult population in terms of age, gender, and income.*
- *Conclusions based on the total sample have a maximum margin of error of 3.2% at 90.0% confidence level.*

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Enterprise Tablet Adoption Has Been a Big Surprise

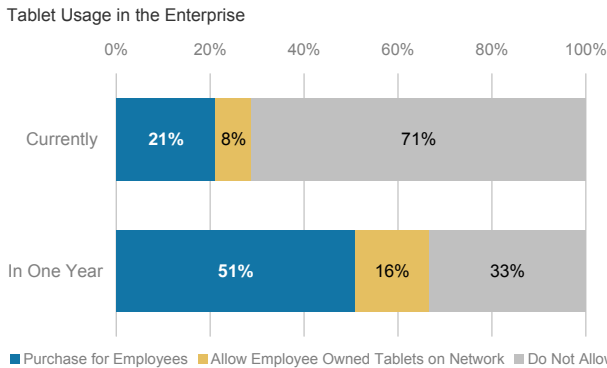
While most expected the addressable tablet market to be limited to consumers, at least initially, enterprise adoption of Apple's iPad has been one of the biggest surprises in the early days of the tablet market. Nine months after Apple launched the iPad, 80% of Fortune 100 companies had either deployed or were piloting the device, according to Apple.

We recently completed a survey of 50 enterprise CIOs and came to a similar conclusion, but the number of companies actually purchasing tablets for employees, versus those allowing employee-owned tablets on the network, was the most interesting takeaway. As our survey shows, 21% of companies currently purchase tablets for employees, but a staggering 51% of companies expect to purchase tablets for employees over the coming year (exhibit 11). In total, 67% of companies surveyed expect either to purchase tablets or provide support for employee-owned tablets over the coming year.

Companies are finding a broad set of uses for tablets, including general productivity, sales, field service/support, management, healthcare, and others. The iPad's operating system, iOS, has several important enterprise security and management features that have enabled the strong adoption in corporate environments. What's more, a growing set of powerful third-party business applications and the ability to create customized applications for business is creating new, powerful use cases.

February 14, 2011
Tablet Demand and Disruption

Exhibit 11
More Than 50% of Large Enterprises Expect to Purchase Tablets for Employees Over the Next Year

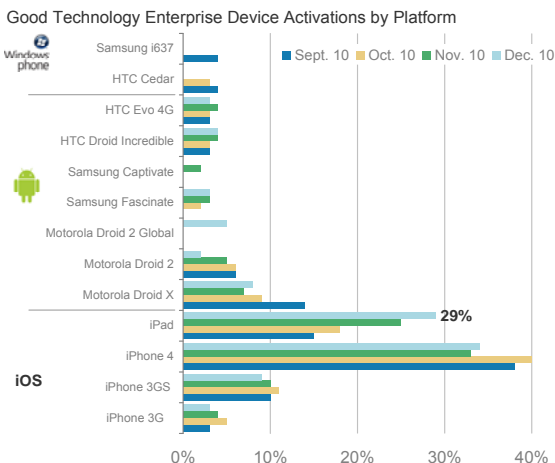


Source: Morgan Stanley Research, AlphaWiseSM

While our survey data is some of the first hard evidence that we have on enterprise adoption, the size and scope of these deployments remains to be seen. Additionally, corporations must deal with securing access, securing devices, application compatibility, and managing multiple operating systems. Over time, these areas represent some of the biggest opportunities for software vendors. Near term, a number of the software-as-a-service vendors are solving these problems for customers by effectively making applications consumable content.

In another sign of rising enterprise tablet adoption, iPads accounted for 29% of new enterprise activations of Good Technology software in December 2010 (up from 25% in November 2010). Good Technology software enables secure access to corporate networks and messaging applications from a variety of devices (exhibit 12).

Exhibit 12
iPads Represented 29% of Good Technology Enterprise Activations in December 2010



Source: Good Technology, Morgan Stanley Research

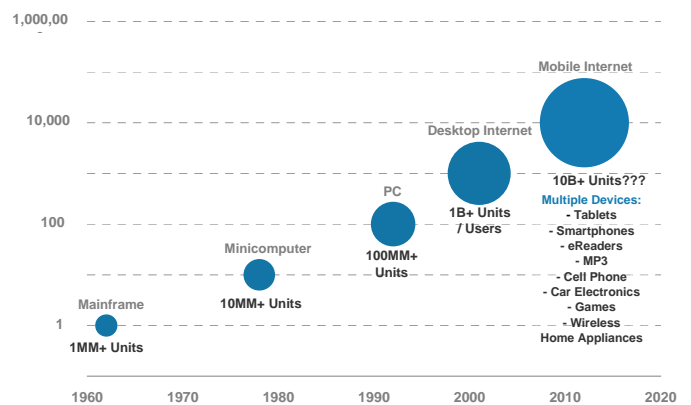
Tablets and the Broader Computing Cycle

From a broader computing cycle perspective, we think we are in the middle of the mobile consumer/internet computing cycle characterized by a fragmentation of computing devices, where computing occurs anytime, anywhere, on a range of internet-connected devices (exhibit 13). Tablets represent a continuation of the computing fragmentation that we have seen over the last few years and follow netbooks, smartphones, eReaders, etc. (exhibit 14). All of these devices highlight the broader shift of computing towards mobile devices and away from the desktop and traditional notebooks. Relative to its closest cousin, the netbook, we think tablets (as measured by the iPad) offer a more attractive form factor, which we think represents a potential bridge for traditional PC players to adapt to the new wave of mobile computing. (Please see the *Mobile Internet Report*, published December 15, 2009, for additional perspective).

We highlight five key trends that are converging to drive the mobile internet/consumer computing cycle, device fragmentation, and tablet adoption: 1) mobility, 2) connectivity, 3) operating system innovation, 4) applications/services, and 5) power-efficient processors.

Exhibit 13
Tablets: Part of Mobile Internet Computing Cycle

Computing Growth Drivers Over Time, 1960 - 2020E
Devices / Users (MM in Log Scale)



Source: ITU, Mark Lipacis, Morgan Stanley Research

Mobility. Smaller and lighter form factors enable consumers to access computing resources and the internet anywhere, anytime. Consumers have shown a preference for smaller, lighter, and more portable devices – desktops have been declining as a percentage of PC shipments for several years, and netbook adoption increased quickly, with mobility as the main attraction. The volume and weight of a tablet computer is approximately 80% below traditional notebooks and 60%

February 14, 2011
 Tablet Demand and Disruption

below netbooks, and we believe this enhanced mobility will emerge as a key driver of tablet computing adoption.

Connectivity. Ubiquitous connectivity is becoming a necessity for many consumers. Desktops and notebooks connect to the internet via traditional ethernet connections and WiFi. Tablets take connectivity to the next level, combining WiFi with cellular connectivity and GPS. Cellular connectivity allows access to the internet anywhere, and GPS enables access to a growing list of powerful location-based applications and services. We believe the “always-connected” profile of tablets and contract-free data plans will emerge as important drivers of tablet computing adoption.

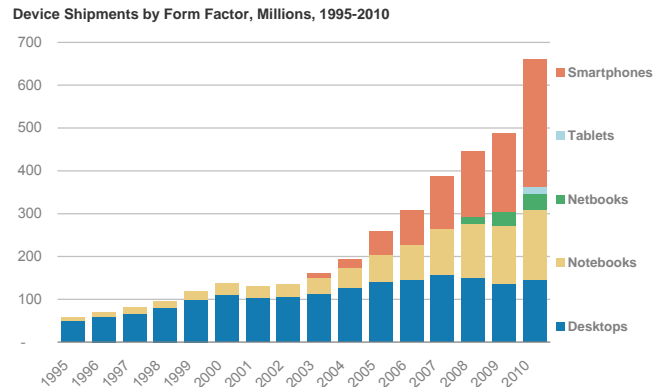
OS/platform innovation. New operating systems with touch screens rather than point-and-click graphical user interfaces have enabled the introduction of a new breed of mobile devices, including smartphones and tablets. We view this user interface progression – from text to graphical to touch – as a natural evolution and one that many consumers will embrace over time. These new operating systems are also optimized for low-power consumption, reducing hardware requirements and the physical size of the devices while increasing battery life.

Applications/services. Tablets bridge the gap between traditional PCs and smartphones. They combine a more PC-like computing and display experience with the mobility, connectivity, and touch optimization of smartphones. Importantly, in addition to many cloud-based services, tablets gain access to application stores that already contain hundreds of thousands of smartphone applications and a growing list of tablet-optimized applications. Apple already

has more than 60,000 iPad-optimized applications in the App Store.

Power-efficient processors. A new breed of processors built on ARM architecture have enabled the proliferation of mobile computing devices, including smartphones and tablets, where battery life is crucial. ARM-based processors have also driven innovation on traditional PC processors, as Intel and AMD have raced to improve power consumption. The iPad has set a high bar, with up to 10 hours of battery life. The new breed of Oak Trail processors from Intel reduce power consumption, and we expect x86 chips to continue to better balance power and performance over time. Further, for many applications and functions that require more processing or graphics, x86 chips could remain the more functionally rich solution for tablets.

Exhibit 14
Computing Device Fragmentation Underway



Source: IDC, Gartner, Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

Key Tablet Assumptions: Shipments and Cannibalization

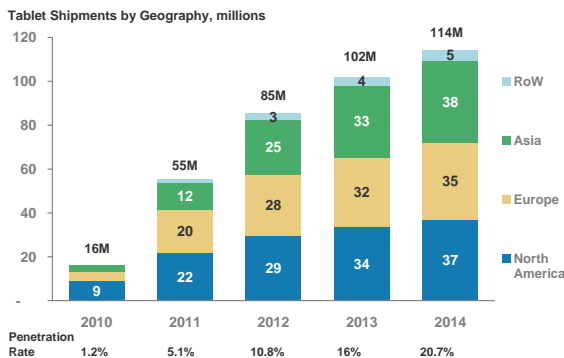
There are clearly several potential outcomes for the nascent tablet market, and we are introducing base, bull, and bear case tablet forecasts, based on demand data from our AlphaWise consumer survey, to compensate for the range of possible outcomes. We use demand data from our survey to derive forecasted penetration rates by region.

Shipments more than triple this year. In our base case, we expect 55 million tablet shipments in 2011 (up from 16 million in 2010), 85 million in 2012, and 102 million by 2013. This forecast is based on a global penetration rate (among the adult internet population) of 5.1% in 2011, 10.8% in 2012, and 16% in 2013 (exhibit 15).

We think it is useful to look at the tablet opportunity by comparing the tablet penetration rate today to that of other computing devices. Based on our survey, tablet penetration is approximately 3% today, compared with 75% for desktops, 63% for notebooks, 30% for smartphones, and 9% for netbooks (exhibit 16).

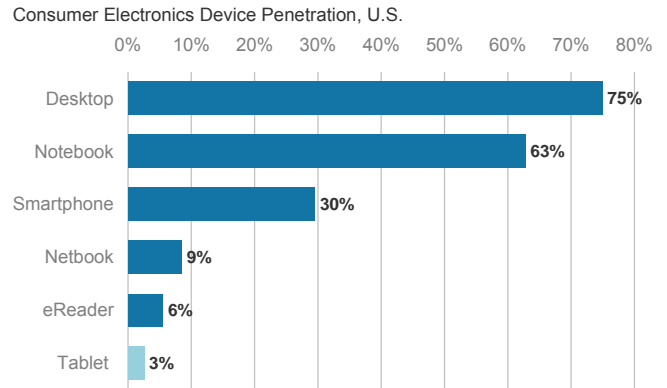
We think there is an upward bias to tablet shipments over the next two years. Our bull case tablet forecast of 65 million shipments in 2011 and 101 million in 2012 is based on a global penetration rate of 5.8% in 2011 and 12.6% in 2012 (exhibit 17). If tablets were to reach global penetration rates similar to those of notebooks or smartphones, the tablet installed base would approach 425-475 million users, versus the 285 million users we currently predict for 2014.

Exhibit 15
Base Case: 55 Million Tablet Shipments in 2011, 85 Million in 2012



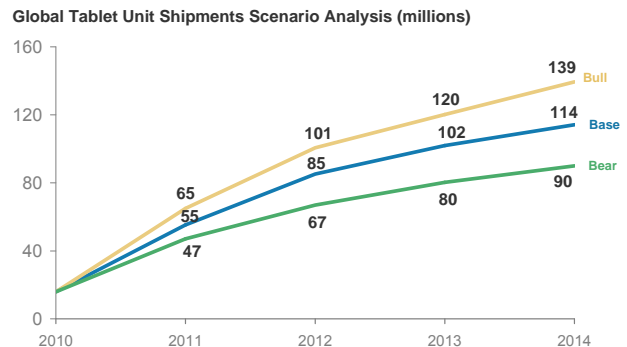
Source: Morgan Stanley Research

Exhibit 16
Putting Tablet Adoption into Perspective



Source: AlphaWiseSM, Morgan Stanley Research

Exhibit 17
Bull Case Upside Potential: 65 Million Tablet Shipments in 2011 and 101 Million in 2012



Source: Morgan Stanley Research

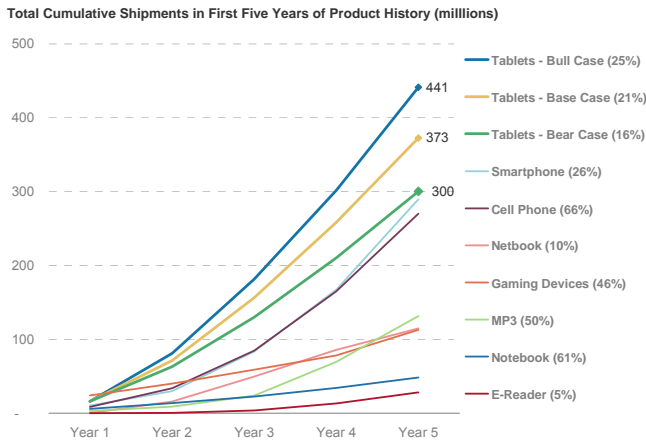
We believe that tablets will follow the adoption path of smartphones, not of netbooks, with a more significant available market opportunity. Just under half of potential US tablet users view a tablet as a notebook, netbook, desktop, eReader, and/or gaming device replacement. These five technology markets represent consumer shipment volume of 200 million units globally in 2010, a market size that is much larger than the 85 million tablets we forecast in 2012, which does not include meaningful enterprise demand.

We view netbooks as an evolutionary step in the traditional notebook form factor, one that comes with a lower price tag, while we view tablets as a revolutionary step in computing. Fundamentally, tablet computing represents the natural evolution of computing from a graphical, keyboard, and mouse user interface to a touch user interface. A tablet is ultra-mobile and “always connected,” and the significant amount of applications and content designed for these devices increases functionality well beyond netbooks and

February 14, 2011
 Tablet Demand and Disruption

traditional PCs. As a result, we expect the tablet adoption curve to ramp faster than any other mobile device in history (exhibit 18).

Exhibit 18
Tablets: The Fastest Ramping Mobile Device

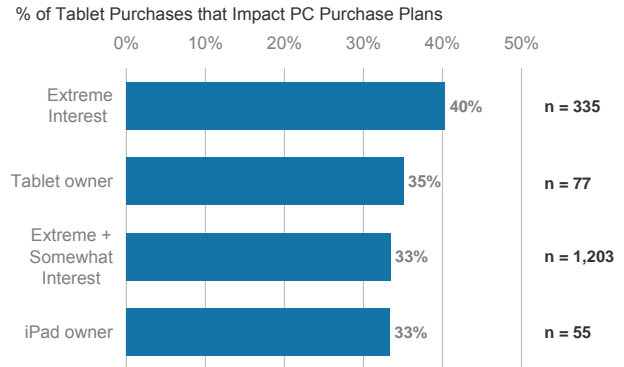


Note: Percentages represent current penetration rates for each device. Figures for bull, base, and bear case forecasts represent penetration rate in year five. For notebook, cell phones, and gaming devices, shipments are in early years of product history.
 Source: Morgan Stanley Research, Gartner, IDC, company reports

Higher-than-Expected PC Cannibalization, Driven by Purchase Deferrals

We think that 29% of tablet purchases will cannibalize PC sales in 2011, leading to a 3 percentage point reduction in PC market growth in 2011, or a 5% reduction in PC units over the next three years. Our survey suggests that 33% of iPad owners and those somewhat or extremely interested in purchasing a tablet will not need to purchase a PC after a tablet purchase (exhibit 19). We intentionally structured our AlphaWise survey questions concerning tablets and PC purchase plans to capture PC purchase deferrals along with outright cannibalization.

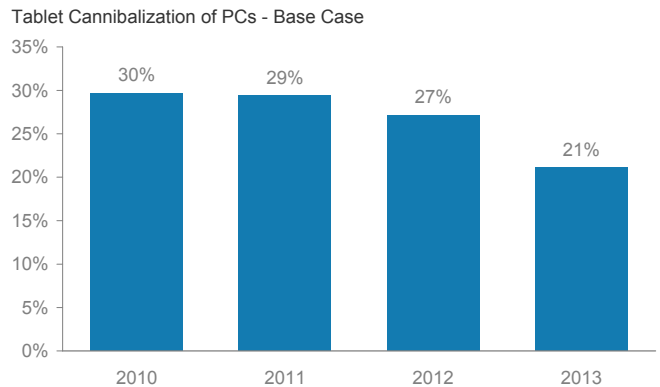
Exhibit 19
Survey Suggests About 33% of Tablet Purchases Will Affect PC Market



Source: AlphaWiseSM, Morgan Stanley Research

We begin with a base cannibalization rate of 33% and assume that only new consumer tablet purchases lead to cannibalization. Essentially, we exclude commercial tablet purchases and replacement tablet purchases over time. These additional assumptions reduce our effective cannibalization assumption from 33% over the forecast horizon to 29% in 2011, falling to 21% in 2013 (exhibit 20).

Exhibit 20
Base Case PC Cannibalization Assumptions



Source: Morgan Stanley Research

Our view is that in the near term the majority of consumer tablet purchases will not indefinitely “cannibalize” a PC purchase but will defer the purchase of replacement PCs. Most tablet owners still need a PC for content-creation activities, to transfer content to a tablet, and to update the tablet operating system. We believe that replacement PC deferrals are the most likely outcome.

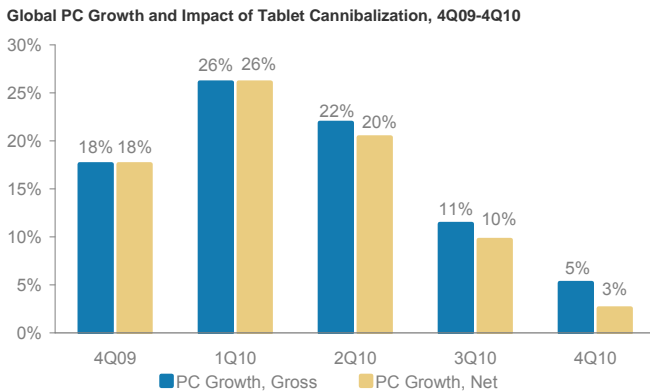
In 2010, we think tablet cannibalization reduced PC market growth by approximately 2 percentage points, or 5 million

February 14, 2011
Tablet Demand and Disruption

units (exhibit 21). In the US market, netbook units have been down approximately 25% year over year on average since the iPad launched in April 2010, after rising 50% year over year on average in the three months leading up to the iPad launch (exhibit 22).

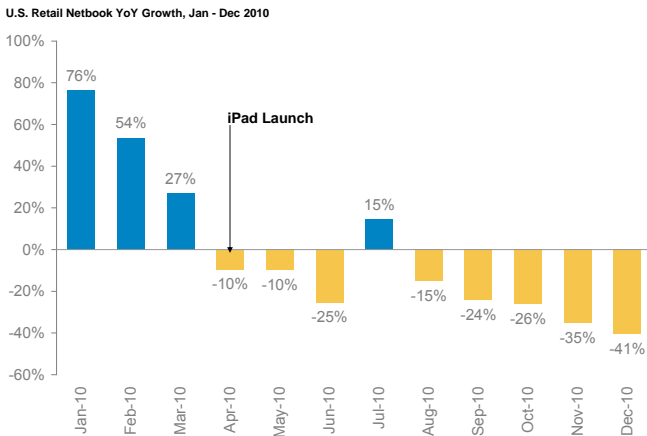
For more detail on tablet cannibalization and how it will affect the PC industry and vendors, please refer to the Hardware section of this Blue Paper on page 19.

Exhibit 21
Tablet Cannibalization Reduced PC Market Growth by 2 Percentage Points in 2010



Source: IDC, Morgan Stanley Research

Exhibit 22
Netbook Units Down 25% YoY Since iPad Launch



Source: NPD, Morgan Stanley Research

State of the Tablet Market

Rapid Specification Increase and LTE

We have seen a rapid increase in hardware specifications for tablets since the iPad launched in April 2010; these new

specifications make these devices considerably more powerful.

For instance, Apple launched the iPad in April 2010 with a single-core ARM system-on-a-chip clocked at 1 gigahertz (GHz) and 256 megabytes (MB) of memory. Many of the upcoming tablets will ship with dual-core 1GHz+ ARM chips and 512MB to 1GB of RAM. Also, the display pixel density (pixels per inch) on many of the upcoming 10-inch tablets will meet or exceed the iPad's 132-pixel density. Finally, several vendors announced 4G, next-generation, wireless-network-capable tablets at the Consumer Electronics show in January 2011, and we expect 4G to be a key marketing message as these tablets launch later in the year.

Supply Constraints

Tablets share several common components with smartphones, and both markets are ramping up quickly, creating supply constraints in several areas. Apple recently announced a \$3.9 billion two-year supply agreement with three vendors, and we think that it is likely an agreement for display components.

Competition Heating Up

Apple was the tablet market in 2010, shipping close to 15 million out of a total 16 million units. Our view is that Apple will remain the dominant player in 2011, with close to 65% share, driven by its first-mover advantage, large installed base of iPad optimized applications (more than 60,000) and content, and overall user experience driven by vertical integration.

That being said, competition is poised to heat up significantly in 2011 with the launch of an onslaught of Android 3.0 tablets from tier-1 vendors (and many more from tier-2+ vendors), the Blackberry Playbook, and, to a lesser extent, Windows 7 tablets and Hewlett-Packard webOS tablets later in the year.

Honeycomb Is Coming

Since Apple redefined the tablet market with the iPad in 2010, several platforms have been hard at work calibrating their tablet strategy.

Apple made the transition into tablets by leveraging the iOS platform initially built for the iPhone and iPod Touch. Similarly, to enter the tablet market, Google will leverage the Android platform built for smartphones. Early Android tablets, such as the Samsung Galaxy Tab, shipped with a version of Android optimized for smartphones —Android 2.2 (Froyo) — but Google has been working on a version of the OS optimized

February 14, 2011

Tablet Demand and Disruption

for tablets called Android 3.0 (Honeycomb) that will launch in the coming weeks. Google recently demonstrated Honeycomb, and the new operating system is built from the ground up for tablets, with a new user interface, newly designed native applications, and an updated web browser.

Android tablets could benefit from a large installed base of developers and applications and several key OEM partners that have experience building on the platform. Several leading OEMs have announced plans to launch Honeycomb tablets by mid-2011, including Google's lead Honeycomb partner, Motorola Mobility (exhibit 23). Similar to the smartphone market, we think Android has the best shot at competing with Apple in the tablet market; we also think that Motorola Mobility and Samsung Electronics are the best-positioned Android tablet vendors in the near term.

Exhibit 23

Several Tier 1 Vendors Launching Honeycomb Tablets by Mid 2011

Brand	Name	Launch	OS	Display	Processor
Acer	Iconia	Apr-11	Android 3.0	10"	Tegra 2 Dual Core 1GHz
Asus	Slider	May-11	Android 3.0	10"	Tegra 2 Dual Core 1GHz
Asus	Transformer	Apr-11	Android 3.0	10"	Tegra 2 Dual Core 1GHz
Asus	MeMo	6/1/2011	Android 3.0	7"	Snapdragon Dual Core 1GHz
HTC	NA	-	-	-	-
LG	G-Slate	Mar-11	Android 3.0	9"	Tegra 2 Dual Core 1GHz
Motorola	Xoom	Feb-11	Android 3.0	10"	Tegra 2 Dual Core 1GHz
Samsung	Galaxy Tab 2	-	-	-	-
Toshiba	NA	-	-	-	-

Note Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.
Source: Morgan Stanley Research

Playbook, Windows 7, and WebOS

Outside of Honeycomb tablets, the BlackBerry Playbook is scheduled to launch in late first quarter 2011. The Playbook is a seven-inch tablet with impressive specifications, running the recently acquired QNX operating system. But there are several important factors that will likely determine the success of the device, including: 1) performance of the QNX OS, 2) developers' interest in the platform, 3) price, and 4) battery life.

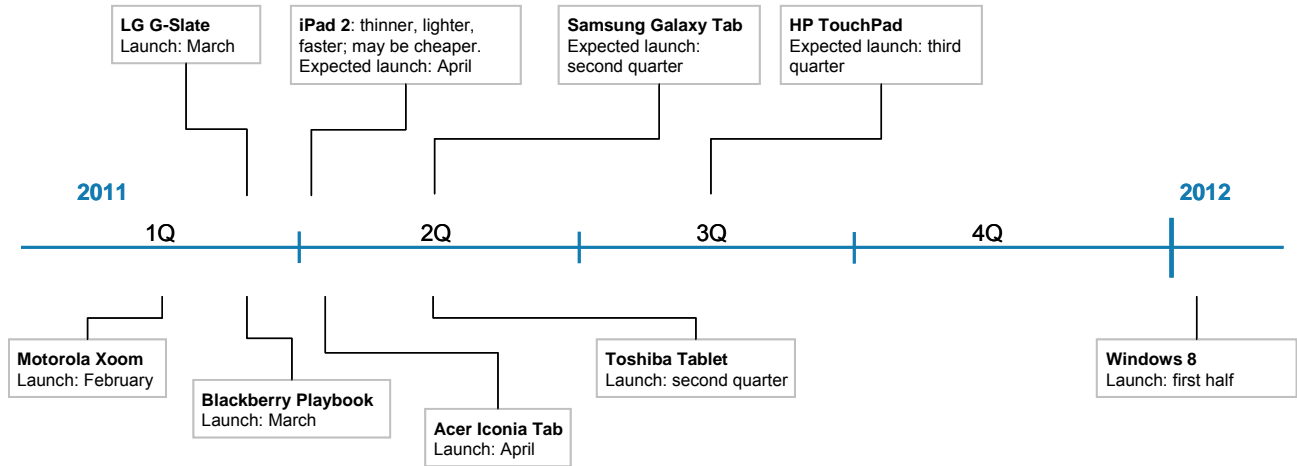
While Microsoft should have a substantially better tablet story when Windows 8 is released in 2012, there will be several new Windows 7 tablets released in the coming months, including several hybrid tablets with keyboards and/or pens to improve input with an OS that was designed for desktop computing.

Last, Hewlett-Packard will release its recently announced TouchPad webOS tablet during the summer of 2011. While the tablet specifications and webOS tablet user interface look impressive, Hewlett-Packard will launch the tablet into a sea of competition, and developer interest, pricing, and battery life remain unclear. (See exhibit 32 on page 25 for an analysis of OEM tablet market share scenarios.)

Next Gen iPad Coming in April

We expect that in April 2011 Apple will launch a second-generation iPad with upgraded hardware specifications, including processor, memory, display, front and rear cameras, and a lighter metal casing. Importantly, because of limited design/form factor changes and scale benefits, we believe Apple could lower the price of the iPad by around \$50. The iPad's lack of Adobe Flash support and USB connectivity remain the largest points of differentiation with competitors.

Upcoming Catalysts for 2011 and 2012








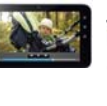








Tablet Adoption Datapoints



February 14, 2011
Tablet Demand and Disruption

Exhibit 24
Detailed Comparison of Tablets

	Apple iPad	Acer Iconia Tab	Asus Slider	Asus Transformer	Asus Eee Slate	Blackberry Playbook	DELL Streak 5	DELL Streak 7	DELL Inspiron Duo	HP Slate	HP TouchPad	Motorola Xoom	Samsung Galaxy Tab	Samsung PC 7
														
Dimensions														
Length (in.)	9.6	NA	10.7	10.7	12.3	5.1	6.0	7.9	11.2	9.2	9.4	9.8	7.5	10.5
Width (in.)	7.5	NA	7.1	6.9	8.2	7.6	3.1	4.7	7.7	5.9	7.5	6.6	4.7	6.9
Depth (in.)	0.5	0.5	0.7	0.5	0.7	0.4	0.4	0.5	1.0	0.6	0.5	0.5	0.5	0.8
Weight (lbs)	1.5	NA	2.0	1.5	2.5	0.9	0.5	1.0	3.4	1.5	1.6	1.6	0.8	2.2
Display														
Size (in.)	9.7	10.1	10.1	10.1	12.1	7.0	5.0	7.0	10.1	8.9	9.7	10.1	7.0	10.1
Resolution	1024x768	1280x800	1280x800	1280x800	1280x800	1024x600	800x480	800x480	1366x768	1024x600	1024x768	1280x800	1024x600	1366x768
PPI	132	149	149	149	125	170	187	133	155	133	132	149	170	155
OS	iOS	Android 3.0	Android 3.0	Android 3.0	Windows 7	Blackberry Tablet OS	Android 1.6	Android 2.2	Windows 7	Windows 7	WebOS	Android 3.0	Android 2.2	Windows 7
Processor	Apple A4 ARM Cortex A8 1GHz	Nvidia Tegra 2 ARM Cortex A9 1GHz Dual Core	Nvidia Tegra 2 1GHz Dual Core	Nvidia Tegra 2 1GHz Dual Core	Intel Core i5 470UM 1.3GHz Dual Core	TI OMAP ARM Cortex A9 1GHz Dual Core	Snapdragon 8250 ARM Cortex A8 1GHz	Nvidia Tegra 2 ARM Cortex A9 1GHz Dual Core	Intel Atom N550 1.5GHz Dual Core	Intel Atom Z540 1.86 GHz	Qualcomm Snapdragon 1.2GHz Dual Core	Nvidia Tegra 2 ARM Cortex A9 1GHz Dual Core	Hummingbird ARM Cortex A8 1GHz	Intel Oak Trail Z670 1.66GHz
Memory	256 MB	1 GB	512 MB or 1GB	512 MB or 1GB	2 GB	1 GB	512 MB	512 MB	2 GB	2 GB	512 MB	1 GB	512 MB	2 GB
Connectivity														
Wi-Fi	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cellular	Option	Y	NA	NA	N	Option Sprint	Y	N	Y	N	Y	Y	Y	Y
4G		Verizon LTE						T-Mobile HSPA+				Verizon LTE	Verizon LTE	
USB	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y
Camera / Video														
Front facing	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MP	N	5.0	1.2	1.2	2	3.0	0.3	1.3	1.3	0.3	1.3	2.0	1.3	1.3
Rear	N	Y	Y	Y	N	Y	Y	Y	N	Y	NA	Y	Y	NA
MP	N	2.0	5	5	-	5.0	5.0	5.0	N	3.0	NA	5.0	3.0	NA
Storage	16 / 32 / 64 GB	16 GB	16 / 32 GB	16/32/64	32GB	16GB	16 GB	16 / 32 GB	320 GB	32 / 64 GB	16/32/64	32 GB	16 GB	32 / 64 GB
Expandable	N	NA	Micro SD	NA	Y	NA	Micro SD	SD	N	SD	NA	SD	Micro SD (16 GB)	NA
Flash support	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: Some tablet specifications are estimated when official data is not available
Source: Company press releases, company websites, Morgan Stanley Research

MORGAN STANLEY BLUE PAPER

Tablet Demand and Disruption



February 14, 2011
Tablet Demand and Disruption

Technology Hardware: Cannibalization Challenges PC Vendors

Kathryn Huberty, CFA
Mathew Schneider, CFA
Ehud Gelblum, PhD
Jasmine Lu
Grace Chen
Keon Han
Kazuo Yoshikawa, CFA

Technology Hardware Industry Key Debates

Debate: What impact will tablet adoption have on the PC market and traditional PC vendors?

Our view: Based on our AlphaWise survey, we believe that 29% of tablet sales will cannibalize PC sales in 2011. At this rate, tablets will reduce PC market growth by 3 percentage points in 2011, or units by 5% over the next three years. While tablets will increase the total addressable market, many traditional PC vendors will face a net negative unit and revenue position in tablets in the near term (although EPS impact appears limited for most vendors). Longer term, the tablet impact on traditional PC vendors is more encouraging.

Debate: Will traditional PC vendors be competitive with smartphone vendors in the tablet market?

Our view: We believe that smartphone vendors are better positioned to capture share in the tablet market than are traditional PC vendors. The one weapon traditional PC vendors have in the tablet market is price, but we do not think they will be able to capitalize until they gain scale.

Best-positioned: Apple, Samsung Electronics, Motorola Mobility, HTC, Research in Motion, Hon Hai Precision

Potentially challenged: Hewlett-Packard, Dell, Acer, Asustek Computer, Lenovo, Toshiba, Sony

What impact will tablet adoption have on the PC market and traditional PC vendors?

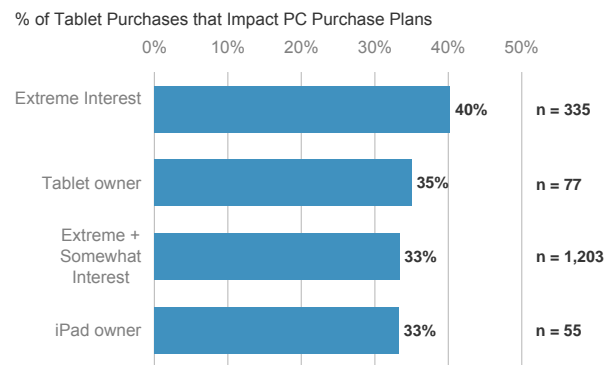
One of the key debates for traditional PC vendors is how tablet purchases will affect the PC market. Our view is that consumer tablet purchases will affect the PC market either through the deferral of a PC replacement purchase or through the outright cannibalization of a PC purchase. In the majority of cases, we think consumer tablet purchases will result in the deferral of a replacement PC purchase, effectively extending the life cycle of existing computers. We do believe that some consumer tablet purchases will result in the indefinite loss of a PC sale, but we think “pure” cannibalization will be limited in the near term. Our definition of cannibalization includes both

of these scenarios because the near-term result of each is the same—the loss of a PC sale.

Bottom line, we think that 29% of tablet purchases will cannibalize PC sales in 2011. According to our survey, 33% of iPad owners and those somewhat or extremely interested in purchasing a tablet said they do not need to purchase a PC after a tablet purchase (exhibit 25).

Exhibit 25

Survey Suggests ~33% of Tablet Purchases Will Affect PC Market

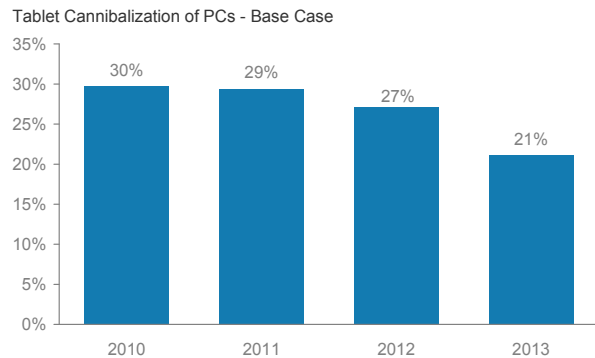


Source: AlphaWiseSM, Morgan Stanley Research

We begin with a base cannibalization rate of 33% and then assume that only new consumer tablet purchases lead to cannibalization (exhibit 26). Essentially, we exclude commercial tablet purchases and replacement tablet purchases over time. These additional assumptions reduce our effective cannibalization assumption from 33% over the forecast horizon to 29% in 2011, falling to 21% in 2013.

Exhibit 26

Base Case PC Cannibalization Assumptions



Source: Morgan Stanley Research

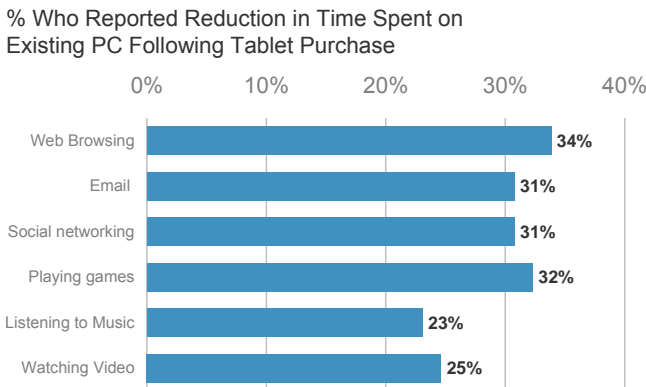
February 14, 2011
 Tablet Demand and Disruption

Our view is that, in the near term, the majority of consumer tablet purchases will not result in “pure” PC cannibalization but will defer the purchase of replacement PCs. Most tablet owners still need a PC for content-creation activities, to transfer content to a tablet, and to update the tablet OS.

We believe that replacement PC deferrals are the most likely outcome. Although most tablet owners still need a PC for content and OS management, we think most will extend the life of their existing PC, as they are using their old PC less, funds are limited, and PC innovation is limited to the high end of the market.

Not surprisingly, tablet owners are using their existing PCs less (exhibit 27). According to our survey, time spent on existing PCs for common content-consumption activities drops materially following a tablet purchase: Thirty-four percent of survey respondents reported a reduction in time spent on their existing PC for web browsing following a tablet purchase. Anecdotal evidence and our own tablet experience suggest that time spent on tablets tends to increase over time following the initial purchase as users discover new use cases and functionality.

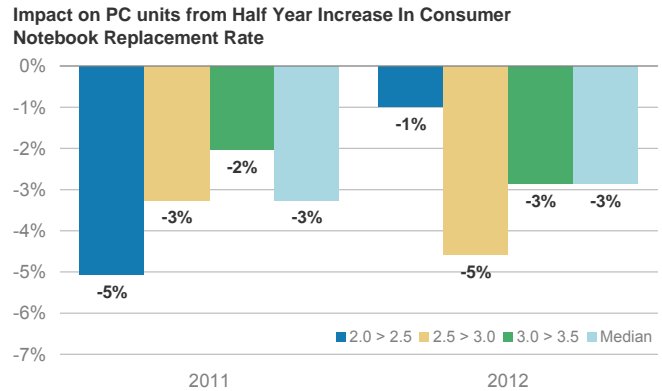
Exhibit 27
Tablet Owners Not Using Old PCs as Much for Content-Consumption Activities



Source: AlphaWiseSM, Morgan Stanley Research

If a tablet purchase results in the deferral of a replacement PC purchase, it will have the same near-term impact as outright cannibalization—a PC sale will not occur. Even small changes to the lifecycle of consumer notebooks can have a material impact on PC sales. Our analysis suggests that a half-year extension in the consumer notebook replacement cycle reduces total PC units by 15 million, or 3%, over the next two years. We would note that this is equivalent to a tablet cannibalization rate of approximately 30% (exhibit 28).

Exhibit 28
Delaying a Notebook Replacement by Six Months Is Equivalent to a Tablet Cannibalization Rate of ~30%



Source: IDC, Morgan Stanley Research

As we mention above, we do not think there is a high prevalence of “pure” PC cannibalization (i.e., buying a tablet instead of a new PC) at this time since most tablet users still need a PC for content-creation activities, to transfer content to a tablet, and to update the tablet OS. We would note that this dynamic could change over time and lead to higher pure cannibalization driven by the following factors: 1) more powerful tablet systems (processor and memory); 2) more robust productivity applications; and 3) over-the-air (i.e., WiFi or cellular) content-synching and OS updates. Our view is that some of these items are likely to occur, leading to upside risk to pure PC cannibalization over the medium to long term.

Last, we would point out that we expect most of the tablet impact on the PC market, both replacement deferral and outright cannibalization, to occur in developed markets, since this is where we expect most of the tablet sales to occur. (However, we would note that our survey points to strong tablet demand in China.) We believe that most tablet sales are supplemental computing devices and this purchase is not feasible for many in emerging markets. According to our estimates, approximately 75% of tablet sales will occur in developed markets in 2011.

What is the impact of cannibalization on the PC market?

According to our analysis, a cannibalization rate of 21-29% is disruptive to the PC market and will reduce units by 5% over the next three years. The revenue impact is slightly less—4%—due to higher ASPs after cannibalization. We expect that notebook/netbook shipments will take the biggest hit, falling by 8% over the same period due to cannibalization (notebook units are still up each year due to core growth, but we assume a decline in netbook sales). We do expect tablets to increase the total addressable market, but there is still an important

February 14, 2011

Tablet Demand and Disruption

disruption in the PC market. Given the range of possible outcomes, we use scenario analysis below to illustrate the impact on the PC market at various levels of cannibalization.

Assuming a tablet cannibalization rate of 10-13% in scenario B, the impact to the PC market is about half of our base case

assumption above – and what we would characterize as only a minor disruption (exhibit 29). Tablet cannibalization of 10-13% would reduce PC units by 3% and revenue by 2% over the next three years. To stress test the model, scenario C assumes a cannibalization rate of 30-44%, which reduces PC units by 6% and revenue by 5% over the same period.

Exhibit 29

Tablet Impact on PC Market Scenario Analysis

		Scenario A (Base Case) Cannibalization = 21-29%				Scenario B Cannibalization = 10-13%				Scenario C Cannibalization = 30-44%			
		2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Shipments (millions)													
A	PCs, gross	351	386	416	439	348	382	411	434	353	390	420	443
B	Cannibalization	(5)	(16)	(23)	(21)	(2)	(7)	(11)	(10)	(7)	(25)	(34)	(31)
C	PCs, net	346	370	393	417	346	374	401	424	346	366	386	412
D	Tablets	16	55	85	102	16	55	85	102	16	55	85	102
E	Total	362	425	478	519	362	430	486	526	362	421	471	514
YoY Growth													
F	PCs, gross	15%	10%	8%	6%	14%	10%	8%	6%	16%	10%	8%	5%
G	PCs, net	14%	7%	6%	6%	14%	8%	7%	6%	14%	6%	5%	7%
H	Tablets		245%	54%	20%	0%	245%	54%	20%	0%	245%	54%	20%
I	Total	19%	17%	12%	9%	19%	19%	13%	8%	19%	16%	12%	9%
Cannibalization rate		30%	29%	27%	21%	14%	13%	12%	10%	45%	44%	40%	30%
Tablet Impact on PC Units													
C/A-1	PCs	-1%	-4%	-6%	-5%	-1%	-2%	-3%	-2%	-2%	-6%	-8%	-7%
	Notebooks	-2%	-7%	-9%	-8%	-1%	-3%	-4%	-4%	-3%	-10%	-13%	-11%
Tablet Impact on PC Growth													
G-F	PCs	-2%	-3%	-2%	1%	-1%	-1%	-1%	0%	-2%	-5%	-2%	1%
	Notebooks	-3%	-5%	-2%	2%	-1%	-2%	-1%	1%	-4%	-8%	-3%	3%
Tablet Impact on Total Addressable Market (PC + Tablets)													
E-A	Unit change.	11	39	62	80	14	48	75	92	9	31	51	71
E/A-1	Percent Change %	3%	10%	15%	18%	4%	13%	18%	21%	2%	8%	12%	16%
Revenue (billions)													
J	PCs, gross	254	271	275	273	254	274	280	276	254	269	272	270
K	Cannibalization	(3)	(9)	(12)	(11)	(3)	(9)	(12)	(11)	(3)	(9)	(12)	(11)
L	PCs, net	251	262	263	262	251	265	267	266	251	260	260	260
M	Tablets	10	28	39	42	10	28	39	42	10	28	39	42
N	Total	261	291	302	304	261	293	306	308	261	289	299	302
YoY Growth													
O	PCs, gross	13%	7%	1%	-1%	13%	8%	2%	-1%	13%	6%	1%	-1%
P	PCs, net	12%	5%	0%	0%	12%	5%	1%	-1%	12%	4%	0%	0%
Q	Tablets		196%	37%	8%	0%	196%	37%	8%	0%	196%	37%	8%
R	Total	16%	12%	4%	1%	16%	13%	4%	0%	16%	11%	4%	1%
Tablet Impact on PC Revenue													
U-1	PCs	-1%	-3%	-4%	-4%	-1%	-2%	-2%	-2%	-2%	-5%	-7%	-6%
	Notebooks	-2%	-5%	-7%	-6%	-1%	-2%	-3%	-3%	-3%	-8%	-10%	-8%
Tablet Impact on PC Revenue Growth													
P-O	PCs	-1%	-2%	-1%	1%	-1%	-2%	-1%	0%	-1%	-2%	-1%	1%
	Notebooks	-2%	-4%	-2%	1%	-1%	-2%	-1%	0%	-3%	-6%	-2%	2%
Tablet Impact on Revenue TAM (PCs + Tablets)													
N-J	Revenue change	7	19	27	32	7	19	27	32	7	19	27	32
N/J-1	Percent Change %	3%	7%	10%	12%	3%	7%	10%	11%	3%	7%	10%	12%

Source: IDC, Morgan Stanley Research

February 14, 2011

Tablet Demand and Disruption

Tablet Cannibalization Impact by Vendor

Based on our assumptions of 140 million tablet shipments and a 27-29% cannibalization rate over the next two years, we believe most key traditional PC vendors will face a 1-4 million-unit headwind per year. Acer, Hewlett-Packard, and Asus are likely to absorb over 50% of the cannibalization, based on our analysis (exhibit 30). Further, we estimate the breakeven tablet market share that each vendor must obtain in order to offset cannibalization. The breakeven market share numbers do not look high (5% or below for all vendors) due to the meaningful tablet volume we expect, but as we highlight below, traditional PC vendors face an increased competitive environment in tablets, meaning it will be harder for them to capture incremental tablet demand.

Exhibit 30

Vendor Cannibalization Unit Impact and Breakeven Tablet Share

	Cannibalized Units			PC		
	2011	2012	Total	Share	Unit Chg. Impact	Breakeven Share
Acer	3	4	8	19%	-5%	5%
HP	3	4	7	18%	-5%	5%
ASUS	2	3	6	15%	-7%	4%
Dell	1	2	4	9%	-5%	3%
Toshiba	1	2	3	8%	-4%	2%
Lenovo	1	1	2	6%	-4%	2%
Sony	1	1	2	4%	-4%	1%
Samsung	1	2	3	7%	-6%	2%
Apple	1	1	1	3%	-3%	1%
LG	0	0	0	1%	-5%	0%
Blackberry	-	-	0	0%	0%	0%
HTC	-	-	0	0%	0%	0%
Motorola	-	-	0	0%	0%	0%
Others	2	2	4	10%	-5%	3%
Total	16	23	39	100%	-5%	

Note Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.

Source: Morgan Stanley Research

Tablet Vendor Share Scenario Analysis and Net Tablet Impact

Our tablet shipment forecast and cannibalization assumptions over the next two years imply 140 million total tablet shipments and 101 million incremental tablet units after tablet cannibalization. The key question is then: What will tablet market share look like, and will traditional PC vendors be able to offset tablet cannibalization? Vendor share will ultimately be a function of tablet OS share, and there are clearly several potential outcomes. To better illustrate a vendor's net impact from tablets and share shifts in the larger PC and tablet

market, we have established a vendor market-share scenario analysis (driven by tablet OS share).

- **Scenario A: Apple maintains tablet market leadership (near term).** Apple, 65% share; Android, 25%; Windows, 5%; and Blackberry Tablet OS and WebOS, 2.5% each.
- **Scenario B: Tablet OS share is similar to the high-end consumer smartphone market.** Android, 48% share; iOS, 34%; Windows, 13%; Blackberry Tablet OS, 4%; and WebOS, 1%. We define the high-end consumer smartphone market as consumer smartphones with a mobile OS and touch screen.
- **Scenario C: Tablet OS fragmentation.** Apple, Android, and Windows, 27% share each; Blackberry Tablet OS and WebOS approximately 10% each.

Apple Likely to Maintain Lead in the Near Term

While we expect competition in the tablet market to heat up through 2011, we expect Apple to maintain tablet market leadership, with close to two-thirds of the market in 2011. Apple was the tablet market for the majority of 2010, and the first real competitor—the Android-based Samsung Galaxy Tab—entered the market in November 2010. We expect Apple to launch a second-generation iPad in April 2011 with hardware upgrades including processor/memory, front and rear cameras, and a lighter metal casing. Importantly, because of limited design changes and scale benefits, we believe Apple is likely to lower the price of the iPad by around \$50. These hardware and price updates, along with iOS 4.2 updates such as multitasking, address most of the common iPad user requests/complaints. The iPad's lack of Adobe Flash support and USB connectivity remain the largest differences with Android- and Windows-based tablets.

Our analysis suggests that in the near term (Scenario A), traditional PC vendors will likely be in a net negative position in tablets, but the EPS impact appears limited for most. Traditional PC vendors will absorb the cannibalization, but we assume that they will not capture much of the incremental tablet demand since Apple will dominate the market in the near term. Below, we estimate the potential EPS impact for each tablet vendor in 2011 based on our base case scenario analysis (exhibit 31; note that these numbers are not reflected in all models).

The largest EPS impact accrues to Acer, followed by Asus and Lenovo, since PCs represent the majority of their operating profit, while PCs represent less than 15% of

February 14, 2011

Tablet Demand and Disruption

operating profit for Hewlett-Packard and approximately 33% for Dell.

Exhibit 31

Estimated Tablet Impact on 2011 EPS

	Base Case	
	Net EPS Impact (USD) 2011	% EPS Impact 2011
Acer	(\$0.01)	-5%
ASUS	(0.02)	-2%
Lenovo	(0.00)	-2%
Dell	(0.01)	0%
Sony	(0.01)	0%
HP	(0.01)	0%
Toshiba	(0.00)	0%
LG	0.03	0%
HTC	0.04	3%
Samsung	2.86	3%
Blackberry	0.20	3%
Apple	3.58	20%
Motorola	0.34	33%

Note Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.
Source: Morgan Stanley Research

Long-Term Impact More Encouraging for Traditional PC Vendors

Longer term, if tablet platform share is more fragmented between Apple, Android, and Windows, our analysis suggests that tablets will be a net positive for the majority of vendors with PC market exposure (Scenarios B and C). Apple and Samsung Electronics appear to be the two best-positioned hardware vendors among those with PC market exposure.

Clearly, tablets are a net positive for smartphone vendors Blackberry, HTC, and Motorola Mobility, since they have no PC market exposure.

Over time, we see several scenarios where tablets could be a positive earnings contributor for many of the traditional PC vendors like Acer, Asus, and Dell, even after cannibalization, since our underlying assumptions are that the majority of tablets do not cannibalize PCs, and we assume that market share fragments (exhibit 32, scenarios B and C).

Hewlett-Packard is the one traditional PC vendor with the most uncertain outlook since the near-term outcome is largely contingent on the success or failure of Hewlett-Packard's WebOS tablets. Hewlett-Packard already has an enterprise-focused Windows-based tablet but will build on WebOS for the consumer market. Hewlett-Packard recently introduced the TouchPad WebOS-based tablet, which will launch over the summer. While the specifications and webOS tablet user interface look impressive, we think its success will depend on 1) developer interest, 2) pricing, 3) distribution, and 4) performance, including battery life.

Our analysis suggests that Hewlett-Packard needs to obtain a tablet market share of approximately 5% to break even. While this does not seem like a stretch for Hewlett-Packard, which had 19% share of the global PC market over the last 12 months, we only assume Hewlett-Packard has more than 5% share in scenario C (under the assumption that WebOS achieves modest success). We would note that if WebOS is not gaining traction, it is likely that Hewlett-Packard would build on Windows and/or Android for the consumer market.

February 14, 2011

Tablet Demand and Disruption

Exhibit 32

Tablets Are a Near Term Negative for Traditional PC Vendors but the Longer Term Is More Encouraging

Unit Shipments (millions)					Scenario A					Scenario B					Scenario C					
Cann. Share	Cannibalized Units	2011	2012	Total	Breakeven Share	Tablet Share	Incremental	Tablets	Total	Net	Tablet Share	Incremental	Tablets	Total	Net	Tablet Share	Incremental	Tablets	Total	Net
Traditional PC Vendors																				
Acer	19%	3	4	8	5%	2%	1	2	3	(5)	6%	4	5	9	1	7%	4	6	10	2
HP	18%	3	4	7	5%	4%	2	3	5	(2)	3%	2	3	4	(3)	14%	8	12	20	13
ASUS	15%	2	3	6	4%	2%	1	2	3	(3)	6%	4	5	9	3	7%	4	6	10	4
Dell	9%	1	2	4	3%	2%	1	2	3	(1)	6%	4	5	9	5	7%	4	6	10	6
Toshiba	8%	1	2	3	2%	1%	1	1	1	(2)	4%	2	4	6	3	2%	1	2	3	0
Lenovo	6%	1	1	2	2%	1%	1	1	1	(1)	4%	2	4	6	4	2%	1	2	3	1
Sony	4%	1	1	2	1%	1%	0	1	1	(1)	2%	1	2	3	1	4%	2	4	6	5
Subtotal	79%	13	18	31	22%	12%	7	10	17	(14)	33%	18	28	46	15	44%	24	38	62	31
PC Vendors with Competitive Smartphone Businesses																				
Samsung	7%	1	2	3	2%	15%	8	12	20	18	10%	5	8	14	11	5%	3	5	7	5
Apple	3%	1	1	1	1%	65%	36	55	91	89	34%	19	29	47	46	27%	15	23	37	36
LG	1%	0	0	0	0%	1%	1	1	1	1	4%	2	4	6	6	2%	1	2	3	3
Subtotal	11%	2	3	4	3%	80%	44	68	112	108	48%	26	41	67	63	34%	19	29	48	44
Smartphone Vendors																				
Blackberry	0%	-	-	-	0%	3%	2	2	4	4	4%	2	4	6	6	10%	6	9	14	14
HTC	0%	-	-	-	0%	1%	1	1	1	1	4%	2	4	6	6	2%	1	2	3	3
Motorola	0%	-	-	-	0%	4%	2	3	5	5	4%	2	4	6	6	2%	1	2	3	3
Subtotal	0%	-	-	-	0%	7%	4	6	10	10	13%	7	11	18	18	15%	8	13	21	21
Others	10%	2	2	4	3%	1%	0	1	1	(3)	6%	4	5	9	5	7%	4	6	10	6
Total	100%	16	23	39	-	100%	55	85	140	101	100%	55	85	140	101	100%	55	85	140	101
Revenue (millions)																				
Cann. Share	Cannibalized Revenue	2011	2012	Total	Cann. ASP	Tablet Share	Incremental	Revenue	Total	Net	Tablet Share	Incremental	Revenue	Total	Net	Tablet Share	Incremental	Revenue	Total	Net
Traditional PC Vendors																				
Acer	17%	1,469	1,988	3,458	456	1%	456	668	1,124	(2,334)	6%	1,594	2,334	3,928	470	6%	1,695	2,482	4,177	719
HP	19%	1,688	2,285	3,973	550	3%	891	1,305	2,196	(1,777)	3%	785	1,150	1,935	(2,038)	13%	3,593	5,261	8,853	4,880
ASUS	9%	811	1,098	1,909	323	1%	456	668	1,124	(786)	6%	1,594	2,334	3,928	2,019	6%	1,695	2,482	4,177	2,268
Dell	9%	825	1,116	1,940	549	1%	456	668	1,124	(817)	6%	1,594	2,334	3,928	1,988	6%	1,695	2,482	4,177	2,236
Toshiba	10%	851	1,152	2,003	675	1%	249	364	613	(1,390)	4%	1,070	1,568	2,638	635	2%	590	863	1,453	(550)
Lenovo	6%	529	716	1,244	557	1%	249	364	613	(631)	4%	1,070	1,568	2,638	1,394	2%	590	863	1,453	208
Sony	7%	611	827	1,439	848	1%	207	303	511	(928)	2%	524	767	1,290	(149)	4%	1,105	1,619	2,724	1,285
Subtotal	77%	6,785	9,182	15,967	512	9%	2,964	4,340	7,304	(8,663)	29%	8,232	12,055	20,287	4,320	39%	10,962	16,052	27,013	11,046
PC Vendors with Competitive Smartphone Businesses																				
Samsung	6%	501	678	1,179	426	11%	3,606	5,281	8,887	7,708	8%	2,409	3,527	5,936	4,757	5%	1,326	1,942	3,269	2,090
Apple	9%	763	1,032	1,795	1,464	73%	23,172	33,931	57,103	55,308	42%	12,101	17,720	29,821	28,026	35%	9,580	14,028	23,608	21,813
LG	1%	95	128	223	567	1%	249	364	613	390	4%	1,070	1,568	2,638	2,415	2%	590	863	1,453	1,230
Subtotal	15%	1,359	1,838	3,197	729	85%	27,027	39,576	66,603	63,406	55%	15,580	22,814	38,395	35,198	41%	11,496	16,834	28,330	25,133
Smartphone Vendors																				
Blackberry	0%	-	-	-	-	2%	684	1,002	1,685	1,685	4%	1,047	1,533	2,581	2,581	9%	2,487	3,642	6,129	6,129
HTC	0%	-	-	-	-	1%	249	364	613	613	4%	1,070	1,568	2,638	2,638	2%	590	863	1,453	1,453
Motorola	0%	-	-	-	-	2%	774	1,133	1,907	1,907	3%	952	1,393	2,345	2,345	2%	524	767	1,291	1,291
Subtotal	0%	-	-	-	-	5%	1,706	2,499	4,205	4,205	11%	3,069	4,494	7,564	7,564	13%	3,601	5,273	8,873	8,873
Others	8%	706	955	1,661	432	1%	207	303	511	(1,151)	6%	1,594	2,334	3,928	2,267	6%	1,695	2,482	4,177	2,516
Total	100%	8,850	11,976	20,825	529	100%	31,904	46,718	78,622	57,797	100%	28,476	41,698	70,173	49,348	100%	27,754	40,640	68,393	47,568

Note: Green = net impact ≥ 1, Yellow = net impact 0, Red = net impact < 0. Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.

Source: IDC, Morgan Stanley Research estimates

Will traditional PC vendors be competitive with smartphone vendors in the tablet market?

Below, we introduce a framework to evaluate the relative positioning of hardware vendors in the tablet market and how tablets will affect their overall business. Based on this framework, we think that smartphone vendors are better positioned to capture share in the tablet market relative to traditional PC vendors. The one weapon traditional PC vendors have in the tablet market is price, but we do not think they will be able to capitalize until they gain scale. First, an overview of the tablet competitive environment.

Rising Competition Driven by Computing Device and Platform Fragmentation

Taking a step back, tablets are part of a broader computing device fragmentation that started in 2007 with netbooks and smartphones. From a competitive standpoint, computing fragmentation opens the door to new competitors that have expertise in a specific form factor or platform (exhibit 33). Take netbooks, for example – netbooks disrupted the PC market status quo in 2007 and drove nine points of PC market share gains for netbook leaders Asus and Acer. Smartphones have a broad capability set, but there is clearly a computing overlap with traditional PCs, including browsing, email, gaming, etc. Most of the leading smartphone vendors are expected to launch tablets by mid 2011. What's more, only two of the top 10 smartphone vendors show up on the top 10 PC vendor list – Apple and Samsung Electronics.

February 14, 2011

Tablet Demand and Disruption

Exhibit 33

Computing Device Fragmentation Driving Share Shifts

Desktops	Notebooks	Netbooks	Smartphones	PC+ Smartphone	Share Chg.
145M units	162M units	37M units	250M units	595M units	
HP (17%)	HP (20%)	Asus (26%)	Nokia (37%)	Nokia (15%)	↓
Dell (13%)	Acer (18%)	Acer (18%)	RIMM (18%)	HP (12%)	↓
Lenovo (9%)	Dell (13%)	HP (16%)	Apple (16%)	Apple (8%)	↑
Acer (6%)	Lenovo (11%)	Samsung (10%)	HTC (8%)	Acer (8%)	↓
Apple (3%)	Toshiba (11%)	Dell (8%)	Samsung (6%)	Dell (8%)	↓

Note: As of 3Q10. Samsung refers to Samsung Electronics.

Source: IDC, Gartner, Morgan Stanley Research

Platform Fragmentation Driving Increased Competition for All, Differentiation for Some

While the traditional PC and netbook market has long been dominated by Windows (more than 95% of market share over the last 12 months), more platform competition is expected in the tablet market, similar to smartphones (exhibit 34). Five tablet platforms will initially compete for market share, including Apple's iOS, Android, Windows, WebOS, and BlackBerry Tablet OS.

The platform clearly driving the increased competitive dynamic in tablets is Android, where at least 10 top-tier OEMs are expected to launch tablets. While Windows 7 is not optimized for tablets, several vendors will build on the Windows platform initially. Microsoft is expected to launch a more competitive tablet platform with ARM support, in addition to x86, in 2012. (For more perspective on OS market share, see the Software section on page 55).

Exhibit 34

Tablet Platform Fragmentation

Platform	Tablet OEM Partners (Expected)
iOS	Apple
Android	Samsung Electronics, Dell, Lenovo, LG, Toshiba, Motorola Mobility, Acer, Asus, HTC, Cisco
Windows	Hewlett-Packard, Dell, Acer, Asus, LG, Samsung Electronics
WebOS	Hewlett-Packard
BlackBerry Tablet OS	RIMM

Source: Morgan Stanley Research

Computing Share Shifting Away from Traditional PC Vendors

While tablets could be a net positive from a unit and revenue perspective for most traditional PC vendors over the long term, market share of the larger computing market is clearly

shifting away from traditional PC vendors (exhibit 35). If we define the market as PCs and tablets (and exclude smartphones for the moment), market share is clearly shifting towards: 1) PC vendors with competitive smartphone businesses, and 2) smartphone vendors that will participate in tablets.

The issue simply comes down to the following factors: 1) tablet market share of traditional PC vendors will likely be below their current PC market share due to increased competition, and 2) we expect tablet volumes to be meaningful enough relative to the PC market to drive share shifts. Under each of the market share scenarios outlined above, traditional PC vendors lose 3-10 percentage points of market share. This computing share shift started a few years ago with smartphones and will likely continue with tablets. What's more, recent innovation in the smartphone market now enables smartphones to power a PC-like computing experience (Motorola Atrix).

Exhibit 35

While Tablets Might Be Net Positive Over Long Term, Traditional PC Vendors Are Poised to Lose Share of Larger PC + Tablet Market

	Core PC Share	Scenario A		Scenario B		Scenario C	
		Share	Chg.	Share	Chg.	Share	Chg.
Traditional PC Vendors							
Acer	13%	11%	-2%	12%	-1%	11%	-1%
Asus	5%	4%	-1%	5%	0%	5%	0%
Dell	12%	11%	-2%	12%	-1%	11%	-1%
HP	19%	16%	-3%	17%	-2%	17%	-3%
Lenovo	9%	8%	-1%	9%	0%	8%	-1%
Sony	2%	2%	0%	3%	1%	3%	0%
Toshiba	5%	5%	-1%	6%	0%	5%	0%
Subtotal	66%	56%	-10%	63%	-3%	60%	-6%
PC Vendors with Competitive Smartphone Businesses							
Apple	4%	15%	11%	4%	1%	11%	8%
Samsung	3%	5%	2%	3%	1%	3%	0%
LG	1%	1%	0%	2%	1%	1%	1%
Subtotal	7%	20%	13%	9%	2%	15%	8%
Smartphone Vendors							
BlackBerry	0%	0%	0%	1%	1%	1%	1%
HTC	0%	0%	0%	1%	1%	1%	1%
Motorola	0%	1%	1%	1%	1%	1%	1%
Subtotal	0%	1%	1%	4%	4%	2%	2%
Other	27%	22%	-5%	24%	-3%	23%	-4%
Total	100%	100%	0%	100%	0%	100%	0%

Note Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.

Source: IDC, Morgan Stanley Research

We introduce a framework to evaluate hardware vendor positioning in the tablet market and the overall impact tablets will have on their business (exhibit 36). This framework is based on the following seven attributes:

- **First-mover advantage.** By the time many vendors begin selling their first tablets, Apple will have an installed base

of approximately 18 million users and more than 60,000 iPad-optimized applications and will be well on its way to releasing a second-generation iPad.

- Platform-vertical integration.** We think hardware vendors that own a platform will have a greater chance of differentiating and gaining share. Given the competition, we expect in the tablet market, we think it will be increasingly difficult for hardware vendors to differentiate themselves on the Windows and Android platforms. Apple clearly falls into the platform-vertical integration category with iOS, App store, and iTunes. The other two hardware vendors that own platforms do so via acquisitions and will launch tablets in the coming weeks/months. Blackberry's Tablet OS and Hewlett-Packard's WebOS fall into this category and we give them credit for the opportunity to differentiate.
- Established/successful high-end consumer smartphone franchise.** We believe that there are important similarities between smartphones and tablets, including form factor, display, OS, connectivity, processor, and distribution. Leading smartphone vendors see the opportunity to leverage their mobility expertise and platform experience to compete in the tablet market. We think that vendors with established and successful smartphone franchises (defined as holding market share of greater than 5%) will have a better chance to capture share in the tablet market relative to traditional PC vendors. Furthermore, we think smartphone vendors that have experience building on the Android platform are particularly well positioned to capitalize on the tablet opportunity. Most exposed: Apple, Blackberry, Samsung Electronics, HTC, and Motorola Mobility.
- Willingness to accept a lower margin.** Traditional PC vendors will likely be willing to accept a lower-gross margin on tablets relative to smartphone vendors. Therefore, they will likely seek to gain tablet market share via lower pricing relative to smartphone vendors. PC gross margins are currently 10-15%, and smartphone gross margins are 30-40%+. We estimate that Apple's iPad gross margin is currently north of 30%. Our view is that tablet systems that provide a good user experience are expensive to produce and vendors that do not have scale might not be able to undercut Apple materially in price,

without sacrificing quality, in the near term. Further, Apple and Samsung Electronics have cost advantages relative to most other vendors driven by processor design and scale in NAND and panels. Lower pricing from traditional PC vendors will likely come at the expense of components (lower storage density, lower quality display, etc.) and design. Over time, as vendors gain scale, we do think that traditional PC vendors will be able to gain share through pricing. Most exposed: Hewlett-Packard, Dell, Acer, Asus, Toshiba and Lenovo.

- PC market exposure.** We believe tablets will be net negative for the majority of traditional PC vendors in the near term. Vendors without PC exposure are better positioned on a relative basis. Most exposed: Blackberry, HTC, and Motorola Mobility.
- Cannibalization exposure.** Taking the PC market exposure a step further, PC vendors that face the largest cannibalization exposure according to our analysis are Acer, Asus, and Hewlett-Packard.
- Tablet share vs. PC share.** As the computing market (PCs and tablets) shifts to tablets, we think hardware vendors that trade lower share in PCs for higher share in tablets are in a strong position. Most exposed: Apple, Samsung Electronics, and LG.

Exhibit 36

Hardware Vendor Framework

	Platform Ownership	First Mover	Successful / Established Smartphone Franchise	Willingness To Accept Lower Margin	PC Exposure	Cannibalization Exposure	Tablet vs. PC share	Total
Apple	1	1	1	0	0	1	1	5
Samsung	0	0	1	0	0	1	1	3
Motorola	0	0	1	0	1	1	0	3
Blackberry	1	0	0	0	1	1	0	3
HTC	0	0	1	0	1	1	0	3
LG	0	0	0	0	1	1	1	3
HP	1	0	0	1	0	0	0	2
Toshiba	0	0	0	1	0	1	0	2
Lenovo	0	0	0	1	0	1	0	2
Dell	0	0	0	1	0	1	0	2
Sony	0	0	0	1	0	1	0	2
Acer	0	0	0	1	0	0	0	1
Asus	0	0	0	1	0	0	0	1

Note Motorola refers to Motorola Mobility; Samsung refers to Samsung Electronics.
Source: Morgan Stanley Research

Tablet Demand and Disruption



February 14, 2011
Tablet Demand and Disruption

Semiconductors: ARM Wins Round One in Tablet CPUs

Mark Lipacis **Bill Lu**
Francois Meunier **Sanjay Devgan**
Ehud Gelblum, PhD **Sundeep Bajikar**

Semiconductor Industry Key Debates

Debate: Will x86-based processors (CPUs) gain meaningful share in the tablet market?

Our view: Apple's selection of ARM as its iPad CPU was based largely on its desire to deliver a tablet with a 10-hour battery life – the more power-efficient ARM won out over the more power-hungry x86. Near term, we expect ARM to continue to dominate tablets. Longer term, we believe that tablet CPU success will be determined by three factors: 1) whether the tablet usage model evolves to require legacy software support and more processing-intensive content-creation capabilities; 2) whether Intel can leverage its manufacturing muscle to make x86 CPUs for tablets on more advanced processes than ARM-based CPUs; and 3) the timing and capability of Windows 8. Most have counted WinTel out of the tablet market – a timely introduction of a lighter-weight Windows OS could enable a more robust internet experience, support for legacy software applications (key for enterprise users), and more competitive battery life.

Debate: Are tablet shipments accretive to semiconductor earnings?

Our view: We believe that tablet shipments will be accretive for the majority of semiconductor companies and drive 2011 EPS for several companies within our global coverage universe, including ARM Holdings, Broadcom, and Qualcomm. Not surprisingly, our tablet cannibalization sensitivity analysis suggests that x86 CPU vendors Intel and AMD are the most at risk from tablets. Our analysis suggests that Intel and AMD could face an earnings headwind of 1% and 4%, respectively.

Best-positioned: ARM Holdings, Broadcom, Qualcomm, Nvidia, Texas Instruments, Marvell Technology Group

Potentially Challenged: Advanced Micro Devices, Intel

Debate: Will x86 application processors gain meaningful share in the tablet market?

Below we review tablet application processor market developments to date, compare x86 and ARM on key factors like power consumption and performance, and introduce a framework for thinking about future x86 adoption in tablets.

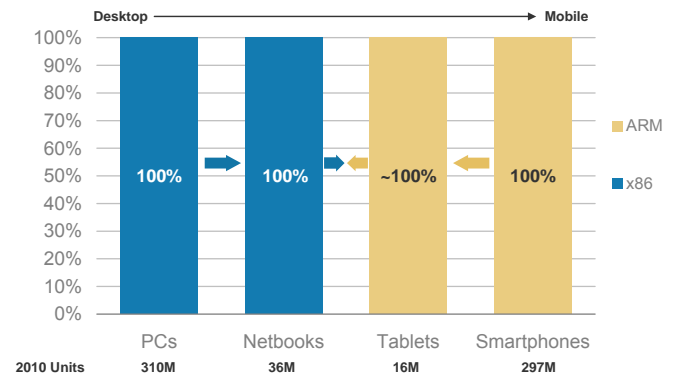
Today, ARM dominates in key mobile device segments like smartphones and tablets, while x86 dominates in traditional computing environments such as servers and PCs. ARM has scaled up from smartphones into tablets, while x86 has scaled down from PCs and servers into netbooks (exhibit 37). Today, x86 is seeking to move down the device continuum towards

tablets and smartphones, while ARM seeks to move up the continuum towards PCs and netbooks.

Exhibit 37

Tablets: x86 versus ARM Battleground

Estimated Processor Market Share by Device, 2010



Source: Morgan Stanley Research

We believe OEMS use the following five factors to evaluate tablet application processors, including:

- 1) Performance
- 2) Power consumption
- 3) Compatibility with OS/platform
- 4) Design flexibility
- 5) Cost

We attribute ARM's early success in tablets mainly to low power consumption and OS/platform compatibility with iOS and Android. Low power consumption is currently the priority in tablets and other mobile devices. Importantly, ARM's early success in tablets is also a function of ARM's success in smartphones. Clearly, smartphone vendors are leveraging their experience/expertise with ARM to enter the tablet market. Originally built as mobile operating systems intended for smartphones, iOS and Android have transitioned into the tablet market, taking ARM along with them.

Near Term Understood, but Future Contingent on Usage Pattern

We believe that tablet CPU success over the medium/long term will likely be determined by how tablet usage evolves over time. Today, tablets are mainly used to consume content – browsing the web, watching video, listening to music, and reading books and magazines – where battery life and low power consumption are paramount. Under this usage model,

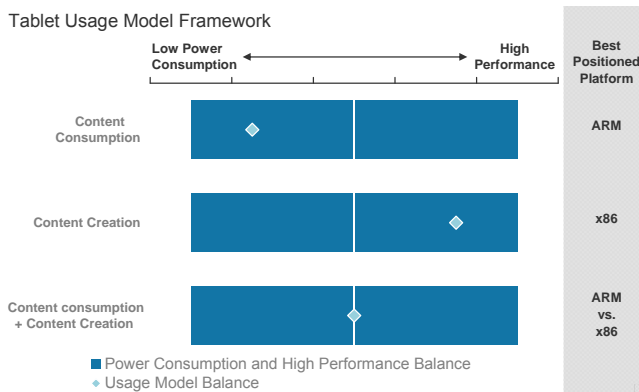
February 14, 2011
Tablet Demand and Disruption

ARM is clearly at an advantage, as we explain below (exhibits 38-40).

However, we see two usage models that could shift the CPU requirements toward x86. First, should the tablet usage evolve towards content-creation activities – e.g., creating and editing files and documents – performance becomes more important and x86 becomes more competitive, in our view. Second, should enterprise users with requirements to support legacy software applications drive tablet growth, x86 would be well positioned to participate in growth in that segment.

Exhibit 38

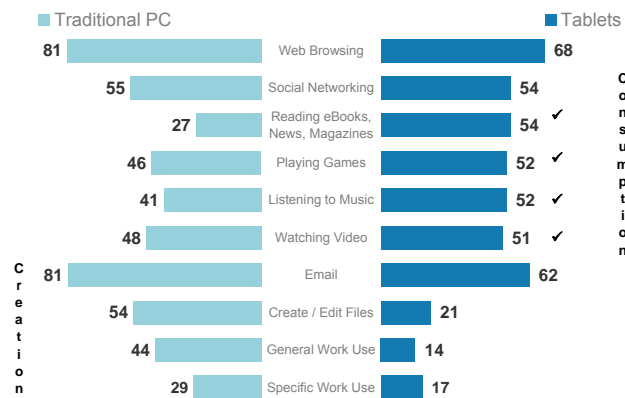
Content Consumption Favors ARM Today



Source: Morgan Stanley Research

Exhibit 39

Content Creation Under-Indexed in Tablets Today



Note: Traditional PC is average of desktop and notebook. Represents percentage of users who use the device regularly for each activity. AlphaWiseSM, Morgan Stanley Research

Platform Comparison: Power, Performance, Design Flexibility and Cost

As it stands today, ARM wears the low-power consumption crown, while x86 is the performance leader. Both platforms are making strides on each other's turf as x86 scales down the power consumption curve and ARM scales up the performance curve.

Exhibit 40

x86 vs. ARM Platform Summary

	x86			ARM		
	Current	Current	Future	Current	Current	Future
	Intel Moorestown	Intel Oak Trail	Intel Cedar Trail	Cortex A8	Cortex A9	A-15
Released	May-10	1Q11	2H11	2005	1Q11	2012
Process Technology	45nm	45nm	32nm	65nm	45nm	32nm
Cores	1	1	2	1	1-4	1-4
Tablet OS Support	Android	Android, Windows 7, Meego	Android, Windows 7, Meego	iOS, Android, Blackberry Tablet OS, WebOS	iOS, Android, Blackberry Tablet OS, WebOS	iOS, Android, Blackberry Tablet OS, WebOS, Windows, Meego

Source: Morgan Stanley Research

Power Consumption: Advantage ARM

ARM currently wins out over x86 in the power-consumption battle. Apple's ARM-based iPad set a high bar for power consumption, with 10 hours of battery life. Below, we compare web browsing and video power consumption on ARM and x86 tablets, assuming a similar battery size. For ARM we compare the Apple iPad and the Samsung Galaxy Tab, and for x86 we compare tablets running both Moorestown and Oak Trail, based on our proprietary analysis.

We find that the power consumption for web browsing and video is approximately 30% lower on ARM as compared with x86 (exhibit 41). The iPad's power consumption is not only materially lower than both x86 platforms but also lower than the ARM-based Samsung Galaxy Tab. We think this is driven by Apple's vertical integration – they design the ARM processor, OS, and hardware as one cohesive system.

Exhibit 41

ARM Power Consumption ~30% Lower than x86 for Web Browsing and Video, We Believe

	iPad	Galaxy Tab	Oak Trail	Moorestown
Processor micro-architecture	ARM	ARM	x86	x86
Processor frequency	1 GHz	1 GHz	1.5 GHz	1.5 GHz
CPU Avg. Power for Browsing / Video (mW)	781	943	1,388	1,110
Browsing/Video Power Consumption Relative to iPad	1.00	1.21	1.78	1.42
Battery life (hrs), adjusted	10	9	6	7
Battery life (hrs), actual	10	7	NA	NA

Source: Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

ARM's Cortex A9 platform will use a 45-nanometer manufacturing process, down from 65nm on Cortex A8, which is the same process node as Intel's Oak Trail platform. ARM Cortex A9 will support up to four cores and is expected to ship in first quarter 2011. While we do not have official data on Cortex A9 power consumption at this point, a recent white paper from Nvidia claimed material reductions in power consumption driven by the dual core architecture of the A9 (40% lower power consumption relative to single core A9).

While Intel made significant progress reducing power consumption in Moorestown versus Menlow, Oak Trail will actually have higher power consumption relative to Moorestown, due to the addition of Windows support.

On the positive side for Intel, as the silicon manufacturing process gets smaller, process technology becomes more important for power consumption, which plays into Intel's strengths. While Intel's Oak Trail will be on the same process node as ARM in 2011 (45nm), Intel has more than three years of years experience with 45nm process technology (high-k/metal gate). Furthermore, Intel recently announced that it would increase its capital spending budget by 80% to \$9 billion to add a fourth 22 nm chip factory. At the same time, it announced plans to hire an additional 1,000 engineers at its design facility in Israel to focus on 22nm chip design. Intel was slow to market with a 32nm x86 CPU for tablets – with the \$9 billion investment this year, we expect it to be more aggressive on 22nm and possibly earlier than competing ARM-based processors, which could narrow the power consumption gap with ARM.

Performance: Advantage Intel/x86

While ARM is the low-power consumption leader today, x86 is the performance leader. To illustrate x86's performance advantage, we present a performance benchmarking analysis of Intel's Moorestown platform relative to several ARM devices that we published last year (exhibits 42-46). Our performance benchmarking analysis tested four key areas: 1) CPU, 2) web page loading, 3) graphics and 4) video. Two things to consider: 1) This analysis was completed during May 2010 and does not reflect the latest generation of processors, and 2) this analysis was conducted on smartphones, and the design tradeoffs differ from those of tablets. Still, we think this performance benchmarking analysis provides some context on ARM versus x86 performance. (For more detail, please see our May 19, 2010 note, entitled *Smartphone and Smart TV*.)

Exhibit 42

Device Mapping for Benchmarking Analysis

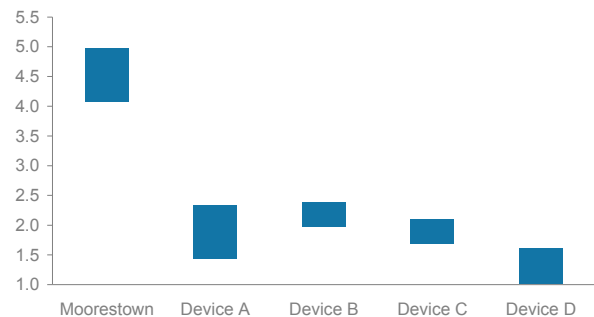
	Device A	Device B	Device C	Device D
CPU Performance	ARM Cortex A9 Dual Core	Snapdragon Dual Core	Snapdragon Single Core	ARM Cortex A8
System Webpage Load: SunSpider	Snapdragon Single Core	ARM Cortex A8	ARM Cortex A8	
System Graphics Perf: 3DMM ES 2.0	Snapdragon Single Core	Snapdragon Single Core	ARM Cortex A8	
Video	Tegra AP20	Snapdragon Single Core		

Source: Company reports, Morgan Stanley Research

Exhibit 43

CPU Performance: Intel's Moorestown Compares Favorably on SpecInt and SpecIntRate Benchmarks

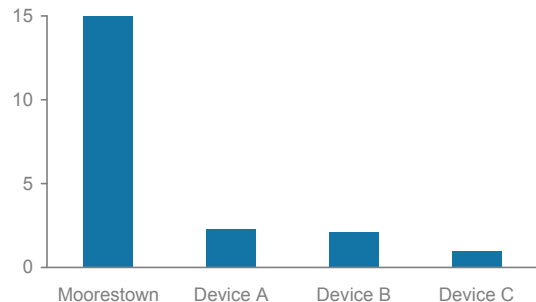
Relative SpecInt Scores



Notes: Device A = ARM Cortex A9 Dual Core, Device B = Snapdragon Dual Core, Device C = Snapdragon Single Core, Device D = ARM Cortex A8
Source: Company reports, Morgan Stanley Research

Exhibit 44

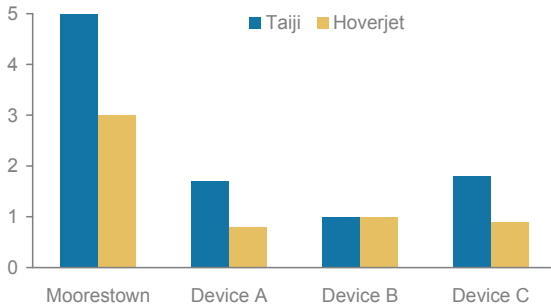
System Webpage Load Performance Using Javascript - Moorestown Dominates



Source: Company reports, Morgan Stanley Research
Notes: Device A = Snapdragon Single Core, Device B = ARM Cortex A8, Device C = ARM Cortex A8; SunSpider test available at: <http://www2.webkit.org/perf/sunspider-0.9/sunspider.html>

February 14, 2011
Tablet Demand and Disruption

Exhibit 45
System Graphics Performance Using 3DMark Mobile ES 2.0 – Moorestown >2x Better



Source: Company reports, Morgan Stanley Research
Notes: Device A = Snapdragon Single Core, Device B = Snapdragon Single Core, Device C = ARM Cortex A8; 3DMark Mobile ES 2.0 is available at: <http://www.rightware.com/en/Benchmarking+Software/3DMarkMobile+ES+ 2.0/>

Exhibit 46
System Performance: Video – Moorestown compares favorably

	Moorestown	Device A	Device B
1080p HP 30fps	>20mbps	NS	NS
1080p MP 30fps	>20mbps	NS	NS
1080p BP 30fps	>20mbps	10mbps	NS
720p HP 30fps	>20mbps	NS	NS
720p MP 30fps	>20mbps	10mbps	NS
720p BP 30fps	>20mbps	10mbps	2mbps

Source: Company reports, Morgan Stanley Research
Notes: Device A = Tegra AP20, Device B = Snapdragon Dual Core. NS = Not Supported. BP = Base Profile, MP = Mainstream Profile, Hewlett-Packard = High Profile. Fps = Frames per second

While x86 is the performance leader today, ARM is currently scaling up the performance curve and will likely narrow the performance gap with x86 over the next two to three years.

Design Flexibility: Point ARM

Another important difference between ARM and x86 is design flexibility. ARM is a microprocessor architecture that can be licensed from ARM Holdings. Several companies, including Apple, Samsung Electronics, and Nvidia, license technology from ARM, customize their own processors, and outsource production to foundries such as TSMC and UMC.

On the other hand, x86 architecture cannot be easily licensed by third parties, making it difficult for anyone other than Intel or AMD to build x86 processors. There is no material cost difference between x86- and ARM-based application processors.

Current x86 Position in Tablets

Tablets’ requirement for lower power consumption has translated to an advantage for ARM over x86 – at least in the near term – and we expect ARM to dominate market share in 2011. However, Intel has stayed in the game. Intel has more than 35 tablet design wins, including several on Android, such as Asus and Lenovo, which could prove promising.

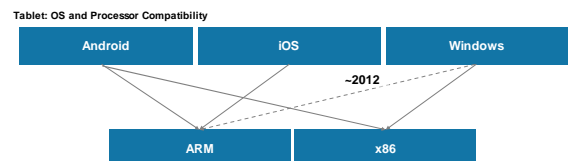
On the positive side, Intel x86 supports a number of operating systems, including Android, Windows 7, and MeeGo (as does ARM for Android and Windows 7). Also, to the extent that users want Windows-based tablets, their only option now is an x86 processor (but this will likely change in 2012).

Windows Support for ARM Is Bad for x86 – Or Is It?

On the OS front, Microsoft has hedged its CPU bets, announcing that the next generation of the Windows operating system, often referred to as Windows 8 (although not officially), will support ARM, in addition to x86 (exhibit 47). Windows on ARM could very well support the movement to the cloud computing model, with thinner client interface and legacy applications running on servers.

We believe this can only be viewed as a positive for ARM, and the conventional wisdom is that this is necessarily negative for x86. We agree with the former but are not so sure on the latter. It is important to remember that WinTel is the platform on which most of the world’s computing applications run. If Windows 8 is designed to support a lower-horsepower ARM processor, then it will likely demand fewer processing cycles from the x86 CPU as well, translating to a lower-power-consuming WinTel tablet. Should Microsoft introduce a lightweight OS, it could very well enable a more robust internet experience and support for legacy software applications (critical for enterprise users), coupled with a much more competitive battery life. Many users, particularly in the enterprise market, have made huge investments in software applications that run on the WinTel platform. We would not expect them to abandon that investment if they did not have to. We think that it is too early to make the call that WinTel in the tablet is dead.

Exhibit 47
Microsoft Adding CPU Support to Include ARM



Source: Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

Debate: What is the net earnings impact from tablets on semiconductor companies?

Tablets should be EPS Accretive for Most Semiconductor Companies

We believe that tablets will be accretive for the majority of semiconductor companies and drive 2011 EPS upside for several companies within our global coverage universe, including ARM Holdings, Broadcom, and Qualcomm.

Not surprisingly, our tablet cannibalization sensitivity analysis suggests that x86 CPU vendors Intel and AMD are the most at risk from tablets. Intel and AMD absorb the tablet cannibalization, and we do not expect them to participate in the upside from tablets. Our analysis suggests that Intel and AMD could face earnings headwinds of 1% and 4% in 2011. Despite Intel's 80%+ share in PC CPUs, we believe that AMD will face a greater earnings headwind because the company has a smaller earnings base due to lower profitability levels.

Tablet Earnings Analysis

We first estimate upside from silicon content in tablets, making assumptions about attach rates and market share for various semiconductor components. Our analysis is based on Morgan Stanley's global tablet shipment forecast. We then estimate downside from silicon content lost due to tablet cannibalization, and finally net the two to calculate EPS impact. Below we provide a summary of the various semiconductor components, along with a description of the component and the companies within our coverage that have exposure to each component (exhibit 48).

Exhibit 48

Semiconductor Component Summary

Component	Description	Company Exposure
CPU / MPU	Central processor	INTC, AMD, ARM, NVDA, QCOM, TXN, MRVL
GPU	Graphics processor	INTC, AMD, ARM, NVDA, QCOM, TXN, MRVL
HDD SoC	Storage control	MRVL, LSI
WiFi	Enables WiFi	INTC, BRCM, TXN, MRVL
Bluetooth	Enables Bluetooth	BRCM, TXN, MRVL
3G	Enables 3G	QCOM, TXN, MRVL, SWKS
Video Codec	Enables video	BRCM, TXN, MRVL
Regulators, PMIC, Mux	Power Management	TXN, MRVL, LLTC
Touchscreen / Multi touch Controller	Enables touch / multi touch	BRCM

Source: Morgan Stanley Research

Tablet Processor Assumptions

We expect to see the most semiconductor competition in application processors (CPU) and provide a framework to think about market shares for different ARM-based and x86-based CPUs in tablets (exhibit 49). For the purpose of this sensitivity analysis, we assume that the iPad will have the majority of tablet market share in 2011, while other vendors refine various aspects of their products to gain share over the medium to longer term.

Our tablet application processor market share estimates incorporate our view that the Snapdragon CPU (Qualcomm) is the only processor other than Apple's A4 to have proven its capabilities within Android-based smartphones. All of the other CPUs listed are relatively unproven, though they may have a higher number of design wins. As evidenced by the success of Apple's iPad, we believe that tight integration and optimization of hardware and software is a key hinge factor that is likely to determine the relative success of tablet devices. We think Qualcomm has a head start over the others in terms of optimizing Android software for its CPU. Additionally, we think that Snapdragon is better positioned due to its integration of 3G wireless communication capabilities.

We think Nvidia's Tegra-2 has good potential, and our checks indicate that Nvidia has worked hard to optimize Tegra-2 for low-power consumption, after first introducing it at the beginning of 2010 with limited initial success. We estimate 4% market share for Tegra-2, in part due to the large number of design wins (up to 50 or more) that Nvidia appears to have secured in tablets. We note, however, that initial reviews of Tegra-2 based tablets (e.g., Toshiba's Folio 100) are not positive.

In the case of Marvell, we think market share will be determined by the success of the Playbook tablet, which we believe currently uses the OMAP processor from Texas Instruments (TI) with the QNX OS but is expected to transition to a Marvell Armada CPU. We believe that both Marvell and TI are well positioned with broad portfolios of processors, communications/connectivity, and analog/power management offerings for tablets.

Given the focus of OEMs on power consumption versus performance in the context of the current content consumption tablet usage model, we assume that Intel's share will be at most 2% in the near term. We would note that for consumers who want to purchase a Windows-based tablet, Intel and x86 will benefit because Windows 7 currently does not support ARM (but as we note above, this could change over time).

Exhibit 49

CPU Market Share Assumptions

MPU	Vendor	Architecture	Share	Comment
A4	Apple	ARM	80%	iPad
Snapdragon	Qualcomm	ARM	9%	Early success with Android
Tegra	Nvidia	ARM	4%	First to dual-core ARM
Hummingbird	Samsung	ARM	2%	Galaxy Tab
Armada	Marvel	ARM	2%	Tri-Core solution ships mid '11
Atom	Intel	x86	2%	Supports Win 7, Android
OMAP	T.I.	ARM	1%	Blackberry Playbook
			100%	

Source: Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

Upside from Tablets

To estimate the revenue upside from tablets, we start with an assessment of the silicon content within tablets, taking into account assumptions about attach rates and market shares (exhibit 50). The Attach Rate column shows our view of expected penetration for the particular type of silicon component listed – a power amplifier (Skyworks PA) is needed only in tablets with built-in 3G wireless connectivity, and we assume 40% of all tablets will have 3G connectivity. We assume all tablets will incorporate all the other components listed (100% attach rate).

Next, we estimate market shares for the specific components supplied by our covered companies, followed by ASPs for each component. When combined with our estimate for the tablet TAM units for 2011, this analysis provides revenue estimates for each of the listed components.

Exhibit 50

Semiconductor Upside from Tablets Assumptions

	ASP (\$)	Share (%)	Attach Rate (%)
BRCM WiFi+BT+FM combo	\$6.5	80%	100%
BRCM Touchscreen controller	2.3	80%	100%
BRCM Multitouch controller	1.4	80%	100%
MXIM PMIC	2.0	10%	100%
NXP Mux	1.0	80%	100%
SWKS PA	1.0	80%	40%
INTC Atom MPU	30.0	2%	100%
QCOM MPU	35.0	10%	100%
QCOM Royalty	8.0	50%	100%
MRVL MPU	30.0	2%	100%
NVDA MPU	30.0	5%	100%
TXN MPU	30.0	1%	100%
ARM-LON	0.5	100%	100%

Source: Morgan Stanley Research

Downside from Cannibalization

To estimate the downside from cannibalization, we follow a similar process and highlight our assessment of silicon content lost due to tablet cannibalization of netbooks and notebooks in exhibits 51 and 52. We apply our assumptions from these exhibits to the tablet units and cannibalization rate forecasts from our Morgan Stanley Global Tablet model to determine the net EPS impact to semiconductor companies in exhibit 53.

Exhibit 51

Semiconductor Downside from Netbook Assumptions

	ASP (\$)	Share (%)	Attach Rate (%)
INTC Netbook MPU+C/S (\$, mn)	\$40.0	100%	100%
LSI HDD SoC	\$4.5	20%	80%
MRVL HDD SoC	4.5	50%	80%

Source: Company reports, Morgan Stanley Research

Exhibit 52

Semiconductor Downside from Notebook Assumptions

	ASP (\$)	Share (%)	Attach Rate (%)
INTC Notebook MPU+C/S	\$90.0	85%	100%
AMD Notebook MPU+C/S	\$65.0	15%	100%
NVDA Notebook GPU	25.0	38%	50%
AMD Notebook GPU	25.0	62%	50%
LSI HDD SoC	4.5	20%	100%
MRVL HDD SoC	4.5	50%	100%
BRCM WiFi	2.0	25%	100%

Source: Company reports, Morgan Stanley Research

Semiconductor 2011 EPS Impact from Tablets

Our analysis suggests that tablets are accretive to 2011 earnings for most semiconductor companies under coverage. Exhibit 53 shows a consolidated view of the estimated net 2011 earnings impact from tablets to semiconductor companies in our coverage universe.

We expect ARM to see the highest positive impact (8% of our 2011 EPS estimate) from tablets in 2011, and Advanced Micro Devices to see the most negative impact (-4% of our 2011 EPS estimate) from tablet cannibalization of notebook CPU and GPU. In the case of Intel, we expect the 2011 EPS impact from tablet cannibalization to be small, at 1% of our 2011 EPS estimate of \$2.26.

As we mention above, the tablet unit forecasts and cannibalization assumptions used in our scenario analysis are based on the Morgan Stanley Hardware team's proprietary surveys and analysis discussed separately in this report. For our base, bull (less cannibalization), and bear cases (more cannibalization), we use tablet units of 55 million, 65 million and 47 million, in 2011 and cannibalization rates of 29%, 13%, and 44%, respectively. Note that while we conservatively attribute 50% of the cannibalization to netbook and 50% to notebook, we believe that tablet capabilities are more likely to be comparable to netbooks rather than notebooks and expect cannibalization to be weighted toward netbooks rather than notebooks.

Exhibit 53

2011e EPS Impact of Tablets

	MS 2011 EPS Estimate	Tablet EPS Impact	Tablet Impact % of 2011 EPS
ARM-LON	\$0.18	\$0.01	8%
BRCM	\$2.39	\$0.12	5%
QCOM	\$2.82	\$0.12	4%
NVDA	\$0.64	\$0.01	1%
SWKS	\$1.57	\$0.02	1%
NXP	\$2.53	\$0.02	1%
MXIM	\$1.59	\$0.01	0%
TXN	\$2.42	\$0.00	0%
MRVL	\$1.58	(\$0.00)	0%
LSI	\$0.46	(\$0.00)	-1%
INTC	\$2.26	(\$0.03)	-1%
AMD	\$0.47	(\$0.02)	-4%

Source: Morgan Stanley Research estimates

February 14, 2011
Tablet Demand and Disruption

Exhibit 54

Semiconductor 2011 EPS Impact from Tablet Growth and Net/Notebook Cannibalization

MS Estimates	ASP (\$)	Share (%)	Attach Rate (%)	Base Case		Scenario 1: Less Cannibalization of Net / Notebook		Scenario 2: More Cannibalization of Net / Notebook	
				2010E	2011E	2010E	2011E	2010E	2011E
				Tablet units				16	55
Cannibalization									
Tablets cannibalize Netbooks				15%	15%	7%	7%	23%	23%
Tablets cannibalize Notebooks				15%	15%	7%	7%	23%	23%
Netbook units cannibalized (mn)				2	8	1	3	4	15
Notebook units cannibalized (mn)				2	8	1	3	4	15
Revenue Upside from Tablet units (\$, mn)									
BRCM WiFi+BT+FM combo	\$6.5	80%	100%	83	286	83	244	83	338
BRCM Touchscreen controller	\$2.3	80%	100%	29	101	29	86	29	120
BRCM Multitouch controller	\$1.4	80%	100%	18	62	18	53	18	73
MXIM PMIC	\$2	10%	100%	3	11	3	9	3	13
NXP Mux	\$1	80%	100%	13	44	13	38	13	52
SWKS PA	\$1	80%	40%	5	18	5	15	5	21
INTC Atom MPU	\$30	2%	100%	0	33	0	28	0	39
QCOM MPU	\$35	10%	100%	56	193	56	165	56	228
QCOM Royalty	\$8	50%	100%	64	220	64	188	64	260
MRVL MPU	\$30	2%	100%	10	33	10	28	10	39
NVDA MPU	\$30	5%	100%	0	83	0	71	0	98
TXN MPU	\$30	1%	100%	0	17	0	14	0	20
ARM-LON	\$0.50	100%	100%	8	28	8	24	8	33
Revenue Downside from lower Netbook units (\$, mn)									
INTC Netbook MPU+C/S (\$, mn)	\$40.0	100%	100%	-96	-330	-45	-132	-144	-585
LSI HDD SoC	\$4.5	20%	80%	-2	-6	-1	-2	-3	-11
MRVL HDD SoC	\$4.5	50%	80%	-4	-15	-2	-6	-6	-26
Revenue Downside from lower Notebook units (\$, mn)									
INTC Notebook MPU+C/S	\$90	85%	100%	-184	-631	-86	-252	-275	-1119
AMD Notebook MPU+C/S	\$65	15%	100%	-23	-80	-11	-32	-35	-143
NVDA Notebook GPU	\$25	38%	50%	-11	-39	-5	-16	-17	-69
AMD Notebook GPU	\$25	62%	50%	-19	-64	-9	-25	-28	-113
LSI HDD SoC	\$4.5	20%	100%	-2	-7	-1	-3	-3	-13
MRVL HDD SoC	\$4.5	50%	100%	-5	-19	-3	-7	-8	-33
BRCM WiFi	\$2	25%	100%	-1	-4	-1	-2	-2	-7
LLTC regulators	\$1	5%	100%	0	0	0	0	0	-1
EPS Impact									
	N.I. Margin		Shares						
INTC	20%		5694	-0.01	-0.03	0.00	-0.01	-0.01	-0.06
NVDA	10%		604	0.00	0.01	0.00	0.01	0.00	0.00
AMD	10%		725	-0.01	-0.02	0.00	-0.01	-0.01	-0.04
BRCM	15%		573	0.03	0.12	0.03	0.10	0.03	0.14
SWKS	17%		185	0.00	0.02	0.00	0.01	0.00	0.02
MXIM	19%		302	0.00	0.01	0.00	0.01	0.00	0.01
NXP Mux	13%		253	0.01	0.02	0.01	0.02	0.01	0.03
LSI	12.5%		637	0.00	0.00	0.00	0.00	0.00	0.00
MRVL	23%		682	0.00	0.00	0.00	0.01	0.00	-0.01
ARM-LON	73%		1382	0.00	0.01	0.00	0.01	0.00	0.02
QCOM	46%		1627	0.03	0.12	0.03	0.10	0.03	0.14
TXN	21%		1162	0.00	0.00	0.00	0.00	0.00	0.00

Source: Morgan Stanley Research estimates. Sorted by Base Case 2011 EPS impact

February 14, 2011
Tablet Demand and Disruption

Exhibit 55

Semiconductor Suppliers for Tablet, Netbook, and Notebook

2011	CPU	GPU	Storage IC	WiFi	Bluetooth	3G	Video Codec	Power Mgmt	Touch Ctrl IC
Tablet									
INTC	X	X		X					
AMD									
NVDA	X	X							
BRCM				X	X		X		X
QCOM	X	X				X			
TXN	X	X		X	X	X	X	X	
MRVL	X	X	X	X	X	X	X	X	
LSI			X						
SWKS						X			
LLTC								X	
Netbook									
INTC	X	X		X					
AMD	X	X							
NVDA		X							
BRCM							X		
QCOM	X	X				X			
TXN								X	
MRVL			X						
LSI			X						
SWKS									
LLTC								X	
Notebook									
INTC	X	X		X					
AMD	X	X							
NVDA		X							
BRCM									
QCOM									
TXN									
MRVL			X						
LSI			X						
SWKS									
LLTC									

Source: Company reports, Morgan Stanley Research

Tablet Demand and Disruption



Hard Disk Drives

Hard Disk Drives: Tablets Not Too Disruptive, Other Threats Linger

Kathryn Huberty, CFA
Scott Schmitz
Shoji Sato

HDD Industry Key Debates

Debate: Is tablet cannibalization as negative as investors assume for the HDD industry?

Our view: Tablets, in isolation, do not appear to be materially disruptive to the hard-disk drive market. We expect to see a reduction in unit demand by 2-3% annually over the next three years, assuming a cannibalization rate of 29% in 2011. We assume that the shift to centralized storage in the home and in the cloud could provide a modest offset to HDD demand in the near term. While we only expect a small unit impact from tablet cannibalization, two issues keep us cautious: 1) the ultimate tablet impact is contingent on vendor supply management, and 2) we expect other trends to put pressure on HDD demand in the coming years, including the shift to PC solid-state drives, desktop virtualization, and the rising adoption of cloud streaming services.

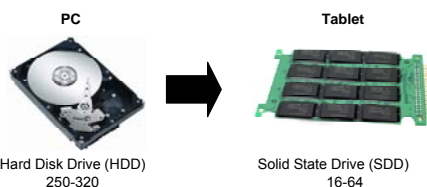
Potentially challenged: Western Digital, Seagate, TDK, Nidec

Is tablet cannibalization as negative as investors assume for the HDD Industry?

From a component perspective, one of the key differences between a PC and a tablet is the type and capacity of storage used in each device. PCs use electromechanical hard-disk drives (HDDs), with an average capacity of approximately 250 to 320 gigabytes (notebooks), while tablets use semiconductor-based storage, called solid-state drives (SSDs), with a much lower average capacity, at approximately 16-64 GB (exhibit 56). At similar capacity points, SSDs cost more than 10 times the amount of HDDs. However, SSDs offer better performance (faster read/write times) and faster boot-up times and are smaller, lighter, and more rugged because of the lack of moving parts—making them more desirable for portable devices. One of the key debates in the HDD market is how tablet purchases affect the PC market and the resulting impact on the HDD market and vendors.

Exhibit 56

Tablets Drive Shift to Lower-Capacity SSDs



Source: Morgan Stanley Research, company websites

To illustrate the impact of cannibalization on the HDD market, we apply a scenario analysis framework similar to the one we use in the hardware section of the report. For all scenarios, we assume tablet shipments of 55 million units in 2011, 85 million in 2012, and 102 million in 2013.

While tablets clearly reduce HDD demand, we do not think the impact will be materially disruptive to the market. Our base case assumes a tablet cannibalization rate of 29% in 2011, falling to 21% by 2013. In this scenario, tablets reduce HDD units by 2% in 2011 and 3% over the next three years (exhibit 57). The fact that approximately 50% of HDD industry units are sold into the PC market (the remainder goes into enterprise storage arrays, servers, consumer electronics, etc.) inherently reduces the overall cannibalization impact relative to the PC market.

Our view is that a 2-3% annual reduction in demand caused by tablets is not materially disruptive to the HDD market. However, the ultimate impact is largely contingent on how HDD market participants manage supply relative to demand expectations. Historically, even in minor situations where supply has exceeded demand, material disruptions have occurred as inventories built up and pricing/gross margins fell. On a positive note, most HDD vendors have built tablet cannibalization into their supply/demand expectations.

Exhibit 57

In Our Base Case, Tablets Reduce HDD Units by 3% Annually Over the Next Three Years

(millions)	2010E	2011E	2012E	2013E
Shipments				
HDD units, gross	658	727	798	866
Tablet cannibalization	(5)	(16)	(23)	(21)
HDD units, net	653	710	775	844
YoY Growth				
HDD units, gross	18%	10%	10%	9%
HDD units, net	17%	9%	9%	9%
Tablet Cannibalization rate	30%	29%	27%	21%
Tablet Impact on HDD Units	-0.7%	-2.2%	-2.9%	-2.5%
Tablet Impact on HDD Unit Growth Rate	-0.9%	-1.7%	-0.7%	0.5%
Revenue				
HDD revenue, gross	33,368	35,102	37,741	39,383
Tablet cannibalization	(190)	(650)	(926)	(859)
HDD revenue, net	33,178	34,452	36,815	38,524
YoY Growth				
HDD revenue, gross	12.7%	5.2%	7.5%	4.4%
HDD revenue, net	12.1%	3.8%	6.9%	4.6%
Tablet Impact on HDD Revenue	-0.6%	-1.9%	-2.5%	-2.2%
Tablet Impact on HDD Revenue Growth Rate	-0.6%	-1.4%	-0.7%	0.3%
Gross Profit				
HDD gross profit, gross	\$7,028	\$5,844	\$6,764	\$7,282
HDD gross margin %	21.1%	16.6%	17.9%	18.5%
Tablet cannibalization	(\$34)	(\$117)	(\$167)	(\$155)
HDD gross profit, net	\$6,994	\$5,727	\$6,597	\$7,127
HDD gross margin %	21.1%	16.6%	17.9%	18.5%

Source: Morgan Stanley Research estimates

February 14, 2011

Tablet Demand and Disruption

In our bull case, we assume a tablet cannibalization rate of 13% in 2011, falling to 10% by 2013. Under this assumption, tablets reduce HDD unit shipments by only 1% annually over the next three years (exhibit 58). Our bear case assumes tablet cannibalization of 44%, falling towards 30% by 2013, which still only reduces HDD unit shipments by just over 3% in 2011 and 4% over the next three years.

Exhibit 58

Tablet Reduce HDD Units by Only 1% in Our Bull Case

	2011E		
	Bear	Base	Bull
Cannibalization Rate	44%	29%	13%
Cannibalized PC/HDD units	-25	-16	-7
Capacity HDD unit offset	0	0	0
HDD unit cannibalization, net	-25	-17	-8
Impact on HDD unit growth rate	-2%	-2%	-1%
% HDD units cannibalized	-3%	-2%	-1%
% HDD revenue cannibalized	-3%	-2%	-1%
HDD revenue impact, net	(\$951)	(\$609)	(\$272)
HDD gross profit impact, net	(\$167)	(\$105)	(\$46)

Source: Company data, Morgan Stanley Research estimates

Shift to Centralized Storage Provides Negligible Offset

As previously discussed, tablets are part of a broader computing device fragmentation that includes netbooks and smartphones. As computing fragments, becoming more mobile and decentralized, devices will rely largely on lower-capacity SSDs as opposed to higher-capacity HDDs for several reasons, including size, weight, and latency. Add to this that tablets are optimized for content consumption—watching movies, listening to music, reading books and magazines, and viewing photos—and it begs the question: Where will people store all their content in a world where devices are more mobile but have lower storage capacity and everyone has more content?

In the near-term, tablet owners will likely continue to store most of their content on existing PCs and external drives, while keeping a portion of their content on various mobile devices; longer-term we expect storage to move to network-connected centralized locations.

Tablets and other mobile devices are driving the need to access content efficiently from a single location across multiple devices. It is both inefficient and inconvenient to store all of your content on a PC and have duplicate copies on

multiple devices. For example, if you download a movie, you should be able to easily access that movie on your TV, PC, or tablet when you have access to your network. We think centralized storage adoption will increase in the coming years as the use of computing devices with lower-capacity SSDs continues to expand. However, we believe that only a portion of this shift to centralized storage will be positive for HDD demand.

Centralized storage comes in two forms:

1) In the home, via a network-attached storage device, such as Western Digital's My Book or Seagate's FreeAgent. We assume a portion of HDD units cannibalized by tablets is offset by an increase in high-capacity drives that store data from multiple PCs and devices on a home network. In our analysis of this impact below, we assume home network drives have four times the capacity of PC HDDs but higher utilization (70% in centralized devices versus 50% for PC HDDs).

2) Cloud-based services, including providers like Spotify for music (and possibly an iTunes cloud/streaming offering down the road), social networks and Google Picassa for pictures, and Netflix and others for movies and TV shows. It is necessary to break cloud-based services into two categories—cloud-storage services and cloud-streaming services—to determine the impact on HDD demand. Cloud-storage services, mostly used for pictures today, could increase demand for HDDs. However, cloud-streaming services, which include music and video, reduce overall storage demand. For example, instead of a million people downloading a given movie, a cloud-streaming service (Netflix, etc.) can store a limited amount of copies on their servers and stream the movie on demand.

We estimate that over the next three years only 5% of cannibalized units will be recovered via the shift to centralized storage (home network-attached storage and cloud-storage services, not cloud-streaming services), but 11% of cannibalized revenue and 19% of cannibalized gross profit is recovered (exhibit 59). The shift to centralized storage is facilitated through high-capacity, enterprise-class HDDs that carry higher ASPs and margins (30% gross margin versus 18% for PC), which drives the larger revenue and profitability offset.

February 14, 2011
Tablet Demand and Disruption

Exhibit 59

Shift to Centralized Storage: Only Modest Benefit

(millions)	2010E	2011E	2012E	2013E
Shipments				
HDD units, gross	658	727	798	866
Tablet cannibalization	(5)	(16)	(23)	(21)
Centralized storage shift	0.1	0.5	1.2	1.5
HDD units, net	653	711	776	846
YoY Growth				
HDD units, gross	18%	10%	10%	9%
HDD units, net	17%	9%	9%	9%
Tablet Cannibalization rate				
	30%	29%	27%	21%
Tablet Impact on HDD Units				
Tablet Impact on HDD Unit Growth Rate	-0.7%	-2.2%	-2.7%	-2.3%
	-0.8%	-1.6%	-0.7%	0.5%
Revenue				
HDD revenue, gross	\$33,376	\$35,143	\$37,844	\$39,511
Tablet cannibalization	(\$190)	(\$650)	(\$926)	(\$859)
Centralized storage shift	\$7	\$41	\$103	\$128
HDD revenue, net	\$33,178	\$34,452	\$36,815	\$38,524
YoY Growth				
HDD revenue, gross	12.7%	5.3%	7.7%	4.4%
HDD revenue, net	12.1%	3.8%	6.9%	4.6%
Tablet Impact on HDD Revenue				
Tablet Impact on HDD Revenue Growth Rate	-0.5%	-1.7%	-2.2%	-1.9%
	-0.7%	-1.5%	-0.8%	0.2%
Gross Profit				
HDD gross profit, gross	\$7,026	\$5,832	\$6,733	\$7,243
HDD gross margin %	21.1%	16.6%	17.8%	18.3%
Tablet cannibalization	(\$34)	(\$117)	(\$167)	(\$155)
Centralized storage shift	\$2	\$12	\$31	\$38
HDD gross profit, net	\$6,994	\$5,727	\$6,597	\$7,127
HDD gross margin %	21.1%	16.6%	17.9%	18.5%

Source: Morgan Stanley Research estimates

We would note that while enterprise HDD gross margins are currently higher than PC HDD gross margins, the spread could narrow in the coming years if the market shifts toward enterprise, increasing competition in the space and lowering pricing and gross margins.

Vendor Impact

Vendors with higher notebook PC and lower enterprise exposure are more at risk from tablet cannibalization. Toshiba and Samsung Electronics have less-diversified product portfolios and are most exposed to cannibalization based on current market share (exhibit 60). However, we would note that the overall impact to the consolidated entities is relatively insignificant, accounting for less than 10% of revenue.

There is not a material difference in the impact tablets might have on the two HDD pure plays—Western Digital and Seagate—but Western Digital will likely experience a larger impact due to its high market share (26%) in the notebook PC category and small enterprise exposure. We estimate that 1.4% of Western Digital's revenue could be at risk due to tablet cannibalization. Seagate's revenue cannibalization exposure is slightly lower, at 1.1%. We believe that the companies that capture incremental demand in the consumer network-attached storage market and high-capacity enterprise market are best positioned in the market longer term.

Exhibit 60

Conglomerates Have Largest Relative Cannibalization Exposure

	Current 2.5" Mobile Mkt Share	Current 3.5" Capacity Mkt Share	Cann. Units (mln)	Cann. Revenue (\$mln)	Cann. % of HDD Revenue 2011	Cann. Gross Profit (\$mln)	EPS Impact 2011
Total			(16.7)	(\$609)	1.7%	(\$105)	
WD	26%	33%	(4.4)	(\$155)	1.4%	(\$26)	(\$0.10)
Seagate	20%	40%	(3.4)	(\$113)	1.1%	(\$18)	(\$0.04)
Toshiba	20%	0%	(3.2)	(\$130)	3.4%	(\$23)	NA
Samsung	12%	0%	(1.9)	(\$75)	2.1%	(\$13)	NA

Source: IDC, Morgan Stanley Research

Looking at the HDD supply chain, we believe TDK, a supplier of HDD heads, is more at risk from tablet cannibalization than Nidec, a supplier of HDD motors. Based on Techno System Research, TDK holds 29% global market share of HDD heads, with Toshiba and Samsung Electronics accounting for 70% of TDK's total shipments. TDK is the sole head supplier at Toshiba and Samsung Electronics, but only accounts for 10% of heads at Seagate and 17% at Western Digital. On the other hand, Nidec holds 77% global market share of HDD spindle motors, but has dominant exposure to all five HDD manufacturers. Nidec's less concentrated customer exposure and more diversified product portfolio put it less at risk from tablet cannibalization.

Tablets Cause Only Modest Disruption

Our analysis suggests that even if you assume a higher-than-expected tablet cannibalization rate, tablets are not that disruptive to the HDD market, reducing units by 3% annually during the next three years. Data creation of roughly 50% annually provides a compelling argument for storage requirements and, more specifically, the capacity benefits of HDDs over SSDs. As such, the industry believes the same amount of storage capacity will still be required.

Beyond the impact from tablet cannibalization, there are other trends converging that will likely pressure the HDD market in the coming years, such as the emerging shift to SSDs in PCs, desktop virtualization, and cloud-streaming services. While the tablet risk in isolation does not appear materially disruptive, the convergence of several trends causes us to take a cautious stance on HDD demand in the coming years.

Tablet Demand and Disruption



Memory Semiconductors

Memory Semiconductors: NAND Is Best Bull Case Play

Keon Han

Kazuo Yoshikawa, CFA

Atif Malik

Frank A.Y. Wang

Memory Semiconductors Key Debates

Debate: Will tablets disrupt the supply/demand balance in the NAND market?

Our view: Using our base case tablet forecast of 55 million shipments in 2011 and 85 million shipments in 2012, we think the NAND market will remain tight, but we do not expect a supply shortfall. We do see the potential for a NAND supply shortfall if our bull case plays out (65 million/101 million shipments in 2011/2012).

Debate: What impact will tablet shipments have on the DRAM (dynamic random access memory) market?

Our view: Despite cannibalization, we believe that tablets will only be a slight negative for the DRAM market in 2011 and we think tablets will be neutral to the DRAM market by 2012 and incremental to the DRAM market by 2013. This is because most tablet shipments are incremental to the total addressable market and we expect rising DRAM content and tablet shipments over the coming years.

Best-positioned: Samsung Electronics, Toshiba, SanDisk

Debate: Will tablet adoption disrupt the supply/demand balance in the NAND market?

The NAND market is a clear beneficiary of rising tablet adoption because tablets use NAND-based, solid-state drives for data storage. NAND is a key tablet component, representing approximately 10-12% of the bill of materials at current prices.

Our Base Case: NAND Market Tight, but Still in Balance

Tablets will increase total NAND unit demand by 17% in both 2011 and 2012, up from 7% in 2010, according to our analysis. We base our analysis on 55 million tablet shipments in 2011 and 85 million in 2012. Importantly, we assume average tablet NAND content of 48 gigabytes in 2010, rising to 55 GB in 2011 and 64 GB in 2012, at a CAGR of 15% (exhibit 61).

Exhibit 61

Tablet NAND Density of 55 GB in 2011 Rising at a 15% CAGR

	Low	Medium	High	Expandable
Apple iPad	16	32	64	N
Samsung Galaxy Tab	-	16	-	Y
Blackberry Playbook	8	16	32	N
Motorola Xoom	-	32	-	Y
HP Slate	32	-	64	N
Dell Streak 7	16	-	32	Y

Source: Company reports, Morgan Stanley Research

We estimate that total NAND unit demand, including tablets, will rise by 76% in 2011 and 79% in 2012. Despite this significant increase in demand, partially driven by tablets, we think that the NAND market will likely be in supply/demand balance in the near term as NAND supply expands to meet demand (exhibit 62).

Strong NAND supply growth is driven by a combination of manufacturing technology migration and wafer additions. Still, because of the rising adoption of tablets and smartphones, the NAND market remains tight and prices have been firm, even during what is normally a seasonally weak period.

Exhibit 62

Our Base Case: NAND Market In Balance Despite Incremental Tablet Demand

	Base Case			
	2010	2011	2012	2013
NAND Unit Demand (1GB equivalents, millions)				
Units, excl. tablet	11,169	17,968	32,225	56,655
Tablet unit demand	768	3,035	5,452	7,503
Units, total	11,937	21,003	37,677	64,158
YoY Growth		76%	79%	70%
Tablet impact (units)	7%	17%	17%	13%
NAND Unit Supply (1GB eq, millions)				
Supply / Demand balance	1.02	1.01	0.98	0.99
NAND Revenue (millions)				
Revenue, excl. tablet	20,133	22,025	27,650	34,029
Tablet revenue	1,384	3,721	4,678	4,507
Revenue, total	21,518	25,746	32,329	38,536
Tablet Shipments (millions)	16	55	85	102
NAND Content Per Tablet Unit (GB)	48	55	64	74
YoY growth		14%	17%	15%

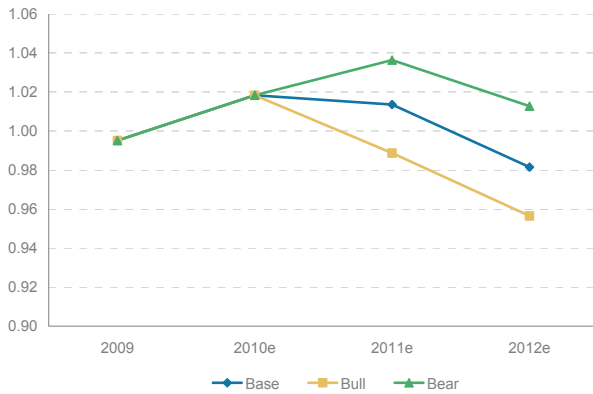
Source: Company data, Morgan Stanley Research estimates

Bull Case Could Push NAND Market into Supply Shortfall

Given momentum in tablet adoption, there is a chance that tablet demand will come in stronger than expected in the coming years. Below, we present a NAND supply/demand scenario analysis driven by bull and bear case tablet shipments (exhibits 63 and 64). A bull case scenario of 65 million tablet shipments in 2011 and 101 million shipments in 2012 could push the NAND market into a supply shortfall in 2011 and 2012. In this scenario, we estimate that the supply shortfall would be 1% in 2011 and 4% in 2012 and that tablets would add 20% of incremental NAND demand in 2011 and 2012, up from 17% in the base case.

February 14, 2011
Tablet Demand and Disruption

Exhibit 63
NAND Supply Shortfall in Bull Case of 65M/101M Tablet Shipments over Next Two Years

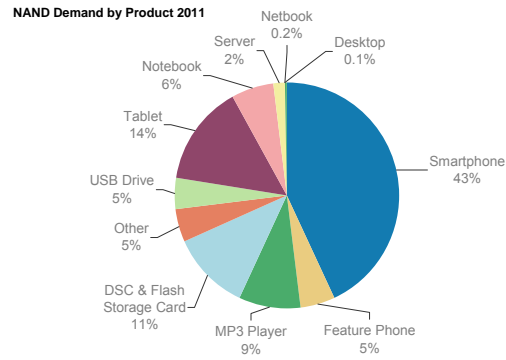


Source: Morgan Stanley Research estimates

Tablets Important, but Not as Much as Smartphones

Although tablets are an important growth driver in the NAND market, smartphones actually generate more than twice as much incremental demand. While NAND content in tablets is much larger than it is in smartphones (48 GB versus 14 GB on average), smartphone unit shipments are significantly higher than tablet unit shipments (423 million smartphones against 55 million tablets in 2011). In 2011, we expect 43% of NAND demand to come from smartphones and 14% from tablets (exhibit 65). In terms of incremental demand (market growth), we expect 55% to come from smartphones in 2011, compared with 25% from tablets.

Exhibit 65
Tablets Represent 14% of 2011 NAND Demand vs. Smartphones at 43%



Source: Morgan Stanley Research

Tablets Broadly Positive for NAND Market

The NAND market is highly concentrated, with Samsung Electronics and Toshiba (including the Toshiba/SanDisk joint venture) accounting for approximately 80% of supply in 2010. Smaller players Micron Technology and Hynix make up the remainder of the market (exhibits 66).

Tablets require high-density, multi-level cell (MLC) embedded NAND. While all NAND suppliers have the capability to produce this product, the cost/margin structure of each supplier can vary widely, depending on its manufacturing technology and scale. SanDisk, through its joint venture with Toshiba, has the largest leverage to NAND, with approximately 100% of revenue exposure. It is likely, in our view, that second-tier players Hynix and Micron will get more aggressive, given the demand environment, but we do not think that they will disrupt the competitive dynamics of the NAND market; DRAM is their main business, and the capex requirement to expand capacity is burdensome.

Exhibit 64
Tablet NAND Supply / Demand Scenario Analysis

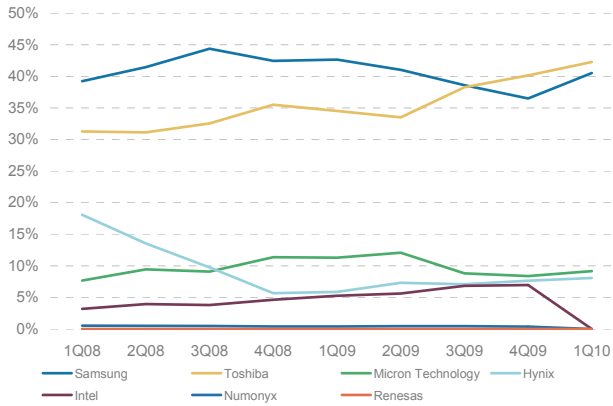
	Base Case				Bull				Bear			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
NAND Unit Demand (1GB equivalents, millions)												
Units, excl. tablet	11,169	17,968	32,225	56,655	11,169	17,968	32,225	56,655	11,169	17,968	32,225	56,655
Tablet unit demand	768	3,035	5,452	7,503	768	3,568	6,440	8,849	768	2,585	4,289	5,909
Units, total	11,937	21,003	37,677	64,158	11,937	21,536	38,664	65,504	11,937	20,553	36,513	62,564
YoY Growth		76%	79%	70%		80%	80%	69%		72%	78%	71%
Tablet impact (units)	7%	17%	17%	13%	7%	20%	20%	16%	7%	14%	13%	10%
NAND Unit Supply (1GB eq, millions)	12,156	21,298	37,042	63,712	12,156	21,298	37,042	63,712	12,156	21,298	37,042	63,712
Supply / Demand balance	1.02	1.01	0.98	0.99	1.02	0.99	0.96	0.97	1.02	1.04	1.01	1.02
NAND Revenue (millions)												
Revenue, excl. tablet	20,133	22,025	27,650	34,029	20,133	22,025	27,650	34,029	20,133	22,025	27,650	34,029
Tablet revenue	1,384	3,721	4,678	4,507	1,384	4,374	5,526	5,315	1,384	3,169	3,680	3,549
Revenue, total	21,518	25,746	32,329	38,536	21,518	26,399	33,176	39,344	21,518	25,194	31,330	37,578
Tablet Shipments (millions)	16	55	85	102	16	65	101	120	16	47	67	80
NAND Content Per Tablet Unit (GB)	48	55	64	74	48	55	64	74	48	55	64	74
YoY growth		14%	17%	15%		14%	17%	15%		14%	17%	15%

Source: Morgan Stanley Research estimates

February 14, 2011
Tablet Demand and Disruption

Exhibit 66

NAND Market Highly Concentrated



Source: iSuppli, Morgan Stanley Research

Debate: What impact will tablet adoption have on the DRAM market?

Our analysis suggests that tablets will be a slight negative for the DRAM market in 2011, but neutral to additive to the market in 2012 and beyond (exhibit 67).

DRAM is used in notebooks, net books, and tablets. Therefore, tablet DRAM will be offset by notebook and netbook DRAM cannibalized by tablets, in our view. While most tablet shipments will be incremental to the total addressable market on a unit basis, tablets currently have less DRAM per unit relative to notebooks and netbooks, which serves to offset the aforementioned increase in the total addressable market.

We assume that tablets have 512 megabytes of DRAM in 2011, 64% less than the 1.4 GB of DRAM in netbooks, and 88% less than the 4.3 GB of DRAM in notebooks. The average tablet DRAM was 256 MB in 2010, but most tier I suppliers will ship tablets in 2011 with a minimum of 512 MB of DRAM. We assume that average tablet DRAM will rise from 512 MB in 2011 to 1 GB in 2012 and 2 GB in 2013.

Consistent with the tablet shipment and cannibalization rates throughout this report, we assume 55 million and 85 million tablet shipment in 2011 and 2012, respectively, and a cannibalization rate of 29% in 2011, declining to 21% by 2013. According to our analysis, tablet shipments will reduce DRAM shipments by 1% in 2011, but the impact will be neutral in 2012 and will actually be 3% accretive in 2013. Over time, we think that the impact of tablets on the DRAM market will turn positive, as both the average amount of DRAM per tablet and tablet shipments rise.

Exhibit 67

Tablets Have Limited Impact on DRAM Market

	Base Case			
	2010	2011	2012	2013
DRAM Unit Demand (1GB equivalents, millions)				
Units, excl. tablet	16,023	23,469	33,653	47,175
Tablet unit demand	32	221	682	1,631
Cannibalization	(79)	(365)	(675)	(815)
Units, total	15,976	23,326	33,659	48,806
YoY Growth		46%	44%	45%
Tablet impact (units)	0%	-1%	0%	3%
Tablet unit shipments	16	55	85	102
DRAM content per Notebook (MB)	256	512	1,024	2,048
Gb per unit equivalent	2	4	8	16
Total impact (Gb, mn)	32	221	682	1,631
Tablet cannibalization rate	30%	29%	27%	21%
Cannibalized Units	5	16	23	21
Notebook Cannibalization Units	2	8	12	11
Notebook cannibalization share	50%	50%	50%	50%
DRAM content per Notebook (MB)	3,163	4,315	5,610	7,292
Gb per unit equivalent	25	34	44	57
Total impact (Gb, mn)	59	274	507	612
Netbook Cannibalization Units	2	8	12	11
Notebook cannibalization share	50%	50%	50%	50%
DRAM content per Notebook (MB)	1,100	1,430	1,859	2,417
Gb per unit equivalent	9	11	15	19
Total impact (Gb, mn)	20	91	168	203
Total PC cannibalization	79	365	675	815

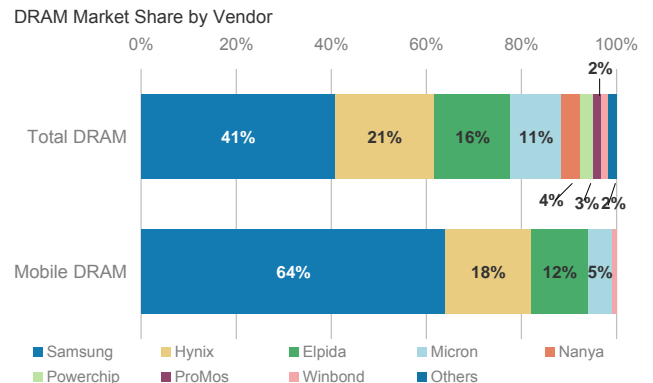
Source: Morgan Stanley Research estimates

Tablets, along with smartphones, use mobile DRAM, which represents approximately 13% of the current DRAM market. Mobile DRAM consumes less power and, to meet the requirements of mobile devices, is smaller than standard DRAM. The mobile DRAM market is not as commoditized as traditional DRAM, since not all DRAM producers have the capability to produce mobile DRAM and it requires customization for each specific device.

Samsung Electronics is the leader in mobile DRAM, with 64% share of the market, and Hynix and Elpidia contribute another 30% of the market. DRAM producers who do not have a mobile DRAM capability are at a strategic disadvantage (exhibit 68).

Exhibit 68

Concentration in the Mobile DRAM Market



Source: iSuppli, Morgan Stanley Research

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Tablet Demand and Disruption

 **TFT-LCD and Touch Panels**

February 14, 2011
Tablet Demand and Disruption

TFT-LCD and Touch Panels: Some Positives for Display Technology

Frank A.Y. Wang
Keon Han
Masahiro Ono

Jerry Su
Young Suk Shin

TFT-LCD and Touch Panel Industry Key Debates

Debate: Will tablet shipments disrupt the supply-demand balance in the touch panel market?

Our View: Despite strong touch panel demand from tablets and smartphones, we think improving manufacturing yields and capacity expansion from incumbent suppliers and new entrants will enable supply to meet demand in the coming years. We also expect prices to fall 10-15% annually over the next two years.

Debate: How will tablet shipments affect TFT-LCD demand?

Our View: Tablet shipments are slightly positive for the TFT-LCD market, driving 1% growth in areal demand and 2% of revenue over the coming years. Tablet shipments are partially offset by cannibalization.

Best-positioned: Young Fast, Chimei Innolux

Debate: Will tablet shipments disrupt the supply-demand balance in the touch panel market?

Touch panels are a key component in tablets, and a key concern has been whether or not tablets will disrupt the supply-demand balance in the touch panel market. Indeed, Apple recently signed a two-year, \$3.9 billion, long-term supply agreement with three vendors, and we believe it likely relates to display technology (LCD and/or touch panels).

Despite the rising adoption of touch panels in tablets and smartphones, we believe that supply will likely be able to meet demand over the coming years. Our view on supply is driven primarily by improving touch panel manufacturing yields, capacity expansion from incumbent suppliers, and new entrants.

There are two main categories of capacitive touch panel technology—glass and film. Apple uses glass because it offers the best touch experience/performance available today. Apple currently procures touch panels from two vendors and will soon add Chimei Innolux as a new supplier.

We expect Apple to continue to use glass-based capacitive touch panels in the coming years. Although the touch panel market was primarily glass in 2010 (since the market was Apple), we think film-based touch panels will grow materially in the coming years, as they are cheaper and lighter (exhibits 69 and 70; Samsung Electronic's Galaxy Tab uses a film-based touch panel.) Broadly speaking, we expect touch panel prices to fall approximately 10% in 2011 and 15% in 2012, driven by rising scale and yield improvements.

Exhibit 69

Film-Based Touch Panels Gaining Popularity

	2010e	2011e	2012e	2013e
Capacitive Touch Panel Shipments (millions)				
Glass	15	41	53	57
Film	1	14	32	45
Total	16	55	85	102
Mix				
Glass	94%	74%	62%	56%
Film	6%	26%	38%	44%
Total	100%	100%	100%	100%

Source: Morgan Stanley Research

Exhibit 70

Glass versus Film Touch Panel Comparison

	Type	Glass		Film	
		Glass/Glass DITO AND SITO	Glass	Glass/Film/Film	Glass/Film
Physical Aspects	Thickness (mm) Weight (g, 10.1") Transmissive	1.575 (0.9t glass) 230 >90%	1/2 (1.1t glass) 180 >86%	1.3 (0.9t glass) 187 >87%	1.075 (0.9t glass) 152 >88%
Features	Full touch Shaping flexibility Border decoration	Y High Color	Gesture only Low Black only	Y High Color	Y High Black only
Sensor Glass Strength	Shatter resistance Strengthening Micro cracking	Low Sheet-based Yes	Low Sheet-based Yes	No shattering N/A N/A	No shattering Cell based No
Manufacturing Process	Photo Lithographic / Print Lamination	Photo-Litho in line 4-masks Hard to Hard	Photo-Litho in line 8-masks Anti-splitting film	Film printing Hard to Soft	Dry film for Glass/Film printing Hard to Soft
Capacity Investment		>Gen 3 glass sensor line	>Gen 3 glass sensor line	Fine pitch film printing	Dry film + Film printing

Source: Company data, Morgan Stanley Research

Touch Panel Suppliers

We highlight Young Fast and Chimei Innolux as well positioned in the touch panel market. Young Fast is currently ramping tablet touch panel production for Samsung Electronics, Acer, and Asus, and we believe that Chimei will be added as a touch panel supplier for Apple in 2011.

Debate: How will tablet shipments affect TFT-LCD demand?

Despite our estimate of 55 million-85 million tablet shipments in 2011-2012 and a cannibalization rate of less than 30%, tablets will only have a slight net positive impact on total TFT-LCD areal demand and revenue. The limited impact is attributable to the fact that the TFT-LCD market is large, driven by TVs and desktop PC monitors, and tablets should represent less than 2% of the total market by 2013 (exhibit 71). According to our analysis, tablets will drive a TFT-LCD areal demand increase of approximately 1% over the forecast horizon (2011-2013), after cannibalization. The increase in demand from tablets is partially offset by tablet cannibalization of PCs. We base our analysis on tablet shipments of 55 million in 2011, 85 million in 2012, and 102 million in 2013, and a tablet cannibalization rate of 29% in 2011, falling to 21% in 2013. We assume tablet cannibalization is split evenly between netbooks and notebooks and that approximately 75% of tablet shipments are 10-inch devices.

Our analysis points to a slightly larger (2%) revenue impact over the forecast horizon, driven by higher ASPs on a portion of tablet TFT-LCDs, as compared to the notebook and netbook TFT-LCDs that tablets cannibalize (exhibit 72).

Apple uses a 9.7-inch FFS (fringe field switching, the small/medium-sized equivalent of IPS-In plane switching-based technology) TFT-LCD in the iPad. We estimate that the FFS ASP premium is significant – approximately \$65 for a 9.7-inch FFS TFT-LCD versus approximately \$30 for a regular 9.7-inch TFT-LCD.

The benefit of FFS is primarily a wider viewing angle, better brightness/transmittance, higher resolution and lower power consumption. For purposes of this analysis, we only assume that a portion of tablet OEMs use FFS TFT-LCDs. Currently, FFS technology is licensed by E Ink to LG Display, Hitachi, Sony-Epson, and IPS Alpha. Apple's FFS displays are mainly manufactured by LG Display and Hitachi.

Exhibit 71

Modest Positive Impact on TFT-LCD Areal Demand...

	2010E	2011E	2012E	2013E
Unit Shipment (mn)				
Desktops	146	152	157	159
Notebook, gross	166	197	221	242
Netbook, gross	39	37	37	38
PC, gross	351	386	416	439
Tablet Cannibalization	(5)	(16)	(23)	(21)
Tablets	16	55	85	102
Total	362	425	478	519
Cannibalization Rate	30%	29%	27%	21%
Tablet Impact on PC Areal Shipments (mn sqm)				
Desktops	19	20	20	21
Notebook	10	12	14	15
Netbook	1	1	1	1
Total, gross	30	33	35	37
Cannibalization	(0)	(1)	(1)	(1)
Tablets	0	1	2	3
Total, net	31	34	36	38
Tablet Impact on PC Areal Shipment (%)	1%	2%	3%	4%
Tablet Impact on Total Areal Shipments (mn sqm)				
LCD TV	63	80	94	104
LCD Monitor	19	20	20	21
Notebook	10	12	14	15
Netbook	1	1	1	1
Others	7	8	9	10
Total, gross	100	121	139	151
Areal Shipment (mn sqm), net				
LCD TV	63	80	94	104
LCD Monitor	19	20	20	21
Notebook	10	12	14	15
Netbook	1	1	1	1
Tablets	0	1	2	3
Cannibalization	(0)	(1)	(1)	(1)
Others	7	8	9	10
Total, net	100	122	140	152
Tablet Impact on Total Areal Shipment (%)	0%	1%	1%	1%

Source: Company data, Morgan Stanley Research estimates

Exhibit 72

...Slightly Higher Revenue Impact Driven by FFS

	2010E	2011E	2012E	2013E
Unit Shipment (mn)				
Desktops	146	152	157	159
Notebook, gross	166	197	221	242
Netbook, gross	39	37	37	38
PC, gross	351	386	416	439
Tablet Cannibalization	(5)	(16)	(23)	(21)
Tablets	16	55	85	102
Total	362	425	478	519
Cannibalization rate	30%	29%	27%	21%
Tablet Impact on TFT PC Revenue (US\$ mn)				
Desktops	8,744	8,483	8,117	7,538
Notebook	9,985	10,821	11,056	10,901
Netbook	1,199	1,072	1,008	942
Total, gross	19,928	20,376	20,180	19,381
Cannibalization	(216)	(682)	(891)	(752)
Tablets	1,179	2,700	3,357	3,545
Total, net	20,890	22,394	22,646	22,174
% change, PCs	5%	10%	12%	14%
Total Market (US\$ mn), gross	104,437	109,552	114,230	113,848
Total TFT-LCD Revenue (US\$ mn), net	105,399	111,570	116,696	116,640
% change, total market	1%	2%	2%	2%

Source: Company data, Morgan Stanley Research estimates

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Tablet Demand and Disruption



Printing and Imaging

February 14, 2011
Tablet Demand and Disruption

Imaging and Printing: Tablets to Reduce Printing Demand

Kathryn Huberty, CFA
Masahiro Ono
Jerry Liu

Imaging and Printing Industry Key Debates

Debate: How will tablet adoption affect printer demand?

Our View: We believe that tablet adoption over the coming years will accelerate the trend toward a reduction in printing demand in developed markets that began in 2006. Importantly, we think that the combination of a tablet's mobility, larger screen size, software ecosystem, and enterprise adoption will lead to a reduction of printing in the enterprise and commercial printing markets (books, magazines, and newspapers), in addition to a reduction of printing in the home. We estimate that, in developed markets, tablets could reduce supplies revenue by 1-2% in 2011 and 2-5% in 2012.

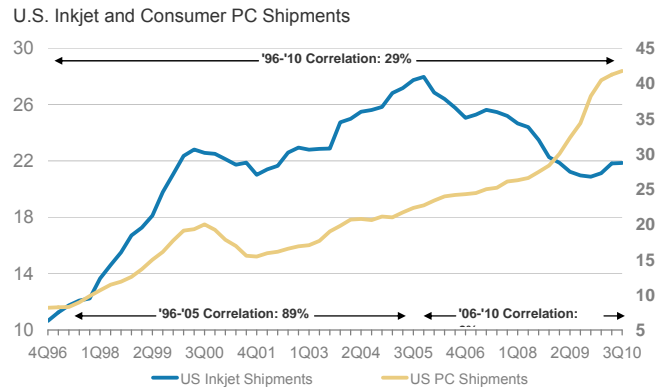
Potentially challenged: Lexmark, Hewlett-Packard, Ricoh

How will tablet adoption affect printer demand?

US Consumer Case Study: Mobile Computing Device Impact on Printer Demand Not New

We believe that tablets represent a continuation of the mobile computing device proliferation (notebooks, netbooks, smartphones, and eReaders) that is collectively serving to reduce printing demand. We believe that mobile devices have reduced consumer-printing demand since 2006, when notebooks began to grow in popularity. Consumer PC and inkjet shipments were highly correlated from the mid-1990s through 2005, when the relationship between the two broke down: the correlation was 89% from 1996-2005 and 0% from 2006-2010 (exhibit 73).

Exhibit 73
PC and Printer Relationship Broke Down in 2006



Source: Morgan Stanley Research, IDC

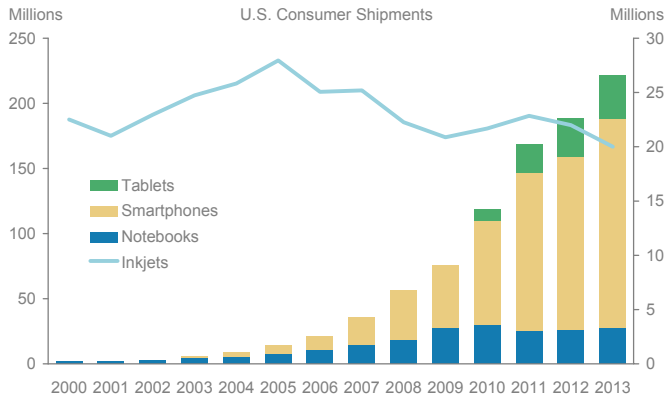
Historically, consumers purchased a printer when they purchased a PC, since computing was largely a desktop experience with an always-connected printer. As consumer notebooks gained popularity, however, computing became more mobile (on the couch, at the coffee shop, in the library, etc.), structurally changing consumer-printing behavior (exhibit 74). Most notebooks were no longer always connected to a printer, and one printer could be shared by several notebook computers. Desktops, which are typically associated with a connected printer, fell from 74% of US consumer PC shipments in 2004 to 55% in 2006 (desktops were 25% of US consumer shipments in 2010), and US consumer notebook shipments rose from 5.5 million in 2004 to 10.8 million in 2006.

Importantly, the mobility, long battery life, application breadth, and screen size of a tablet greatly improves the content-viewing experience and capabilities relative to notebooks, and we think the new breed of mobile devices will further reduce printing demand. What's more, we think tablets will not only reduce consumer-printing demand but will also serve to reduce printing demand in the enterprise and commercial printing markets.

We think that tablets could alter enterprise printing behavior more so than notebooks because: 1) When compared to a notebook, a tablet's mobility, long battery life, and screen size are arguably a superior solution for viewing and presenting documents; and 2) enterprise notebooks are still typically docked and connected to a networked printer when in the office.

February 14, 2011
Tablet Demand and Disruption

Exhibit 74
Since 2005, Mobile Devices Up Eight Times, Inkjet Shipments Down More Than 20%



Source: Morgan Stanley Research, IDC

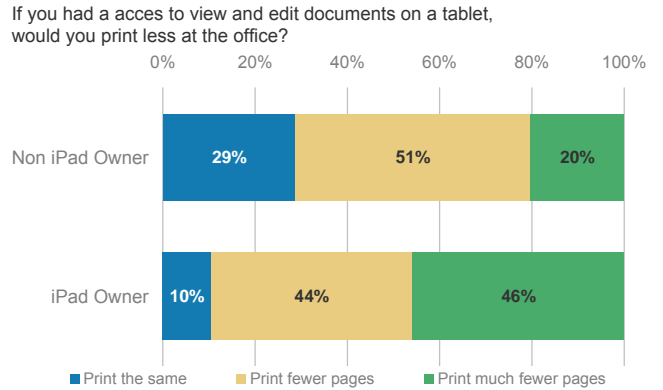
Besides the structural change in consumer-printing behavior caused by notebooks, other drivers of the breakdown in the inkjet and PC shipments relationship could include: 1) longer printer lifecycles, so that consumers don't need to purchase a new printer each time they purchase a PC; 2) printer sharing/household penetration rate saturation; and 3) increased use of email and a reduction in faxing.

Evidence of Tablet Impact on Printing Demand

We expect tablet computers to accelerate the reduction of printing demand in the home and also affect printing demand in the enterprise and commercial printing markets. While the increased consumption of digital newspapers, magazines, and eBooks from tablets is clear, the signs of a reduction in printing are just starting to emerge. Below we present both survey data and a compilation of anecdotes that suggest that tablets are reducing printing demand and that this trend will likely increase over time.

We recently conducted an internal Morgan Stanley survey where we asked 215 respondents if they would print less in the office if they had the ability to edit and view work documents on a tablet. According to our survey, 71% of respondents said they would print less or much less if they had access to work documents on a tablet (exhibit 75). Interestingly, for the 48 respondents who already had a tablet computer, 90% said they would print less or much less if they had access to documents on their tablet.

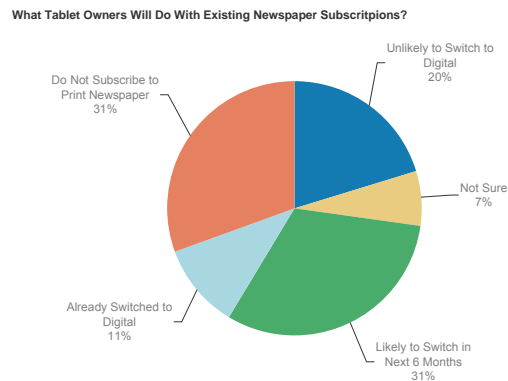
Exhibit 75
Most Tablet Owners Plan to Reduce Office Printing



Source: Morgan Stanley Research

It is well known that tablets and e-readers are driving increased consumption of digital books, newspapers, and magazines, but a recent study highlights how these devices are accelerating cancellations of print subscriptions, thereby reducing commercial-printing demand. In a recent survey by the Reynolds Journalism Institute at the University of Missouri, 11% of iPad users had already cancelled a print newspaper subscription and another 31% said they were very likely to cancel a subscription within the next six months (exhibit 76). While printing vendors such as Hewlett-Packard are benefiting from the analog-to-digital shift in commercial printing, the acceleration of print subscription cancellations brought about by tablets and e-readers will likely mitigate the benefits of this shift.

Exhibit 76
Over 40% iPad Users Surveyed by RJJ Will Soon or Already Have Cancelled a Newspaper Subscription



Source: Reynolds Journalism Institute, Morgan Stanley Research

What affect could tablet adoption have on pages printed?

February 14, 2011

Tablet Demand and Disruption

Our analysis suggests that tablet adoption could reduce supplies revenue by 1-2% in 2011 and 2-5% in 2012, in developed markets. For reference, IDC currently forecasts a 2% decline in page volume, which we use as a proxy for supplies growth in the US, in both 2011 and 2012 (exhibit 77). We focus on the tablet impact on supplies, since hardware has been under pressure for several years and we believe that the majority of tablet purchases, at least initially, will not replace a PC. Therefore, it is likely that tablet owners already own a PC and printer.

We begin with IDC's estimate of total page volume in the US (1.5 trillion in 2010). We then calculate average printed-page volume per adult, distinguishing between inkjet and laser pages printed. From there, we use scenario analysis to calculate the reduction in total page volume, assuming different rates of declines in inkjet and laser (since we assume inkjet page volumes decline at a higher rate than laser). We base our forecast on tablet shipments of 55 million in 2011 and 85 million in 2012.

Anecdotal Evidence of Tablet Impact on Printing

- Hampton, Virginia city council is using iPads to view meeting documents, saving \$18,000 annually in printing costs, according to the *The Daily Press* in Newport, Virginia.
- The cabinet ministers of Saskatchewan province in Canada are using iPads to reduce paperwork, according to the *Vancouver Sun*. The cabinet secretary expects to save \$50,000 annually in courier and printing costs.
- White House staff members use iPads to read newspapers, magazines, and books, according to the *Washington Post*.
- Members of Congress replaced print documents with iPads to reduce printing, according to *Politico.com*.
- US Supreme Court Justice Antonin Scalia uses an iPad to read briefs, while Justice Elena Kagan uses a Kindle, according to CSPAN.
- University of Cincinnati uses iPads to conduct surveys in order to save money, reduce storage space, and improve turnaround time.
- Furniture store Arhaus, with 35 stores in 13 states, uses the iPad to facilitate customer deliveries. The company expects to save \$30,000 a year in paper costs, according to *Information Age*.
- Morgan Stanley, Credit Suisse, and JPMorgan have developed applications that deliver institutional securities research to clients via iPhone and iPad.
- JPMorgan Chase gives bankers iPads to view emails and attachments and to edit documents and presentations, according to Bloomberg.
- Stifel Nicolaus uses the iPad for client presentations and expects to save \$3,000 to \$5,000 per year in paper cost alone.
- EFI, a printer manufacturer that generates nearly half of its revenue by selling controllers that network printers and copiers, noted at its analyst day that they are already seeing content shifting from printed pages to tablets.

February 14, 2011

Tablet Demand and Disruption

Exhibit 77

Reduction in Pages Printed – Developed Markets

2011		Office Printing Decline %									
		0%	3%	5%	8%	10%	13%	15%	18%	20%	23%
Home Printing Decline %	5%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	10%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	15%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	20%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	25%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	30%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	35%	0%	0%	1%	1%	2%	2%	2%	3%	3%	3%
	40%	0%	0%	1%	1%	2%	2%	2%	3%	3%	4%
	45%	0%	0%	1%	1%	2%	2%	2%	3%	3%	4%
	50%	0%	0%	1%	1%	2%	2%	2%	3%	3%	4%

2012		Office Printing Decline %									
		0%	3%	5%	8%	10%	13%	15%	18%	20%	23%
Home Printing Decline %	5%	0%	1%	2%	2%	3%	4%	4%	5%	6%	7%
	10%	0%	1%	2%	2%	3%	4%	4%	5%	6%	7%
	15%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	20%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	25%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	30%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	35%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	40%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	45%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%
	50%	0%	1%	2%	2%	3%	4%	5%	5%	6%	7%

Source: Morgan Stanley Research, IDC

Potential offsets

While consumers have reduced printing due to the proliferation of mobile devices, they still want the option to print if needed. After Apple launched the iPad without printing support, it was commonly cited as one of the most requested features. When Apple updated iOS in November 2010, they added AirPrint, which enables wireless printing from compatible devices. We believe that printer vendors recognize the threat from mobile devices and have been aggressive in rolling out wireless printing functionality. Hewlett-Packard expects more than 40% of its installed base to be web-connected by 2013.

Furthermore, while we focus on tablets' impact on page volume, above, printing vendors have pricing power and typically raise prices each year. This price increase could offset the reduction in page volume.

Vendor implications

We highlight Lexmark as potentially challenged because the company is a pure-play printing vendor and has high-laser and developed market exposure; developed markets and laser account for over 70% of Lexmark revenue. Hewlett-Packard's printer business is also potentially challenged from tablets, but only 20% of total revenue and 30% of operating income come from printing. Of the Japanese printer vendors, we highlight Ricoh as potentially challenged, since it has higher printing exposure relative to Canon or Konica.

MORGAN STANLEY BLUE PAPER

Tablet Demand and Disruption



February 14, 2011
Tablet Demand and Disruption

Software: Opportunities in Management, Applications and Security

Adam Holt
Jennifer Swanson, CFA
Keith Weiss
Melissa Gorham

Software Industry Key Debates

Debate: How will tablet adoption affect Microsoft and what is Microsoft's tablet strategy?

Our view: Apple is the clear tablet operating system leader today, and we expect Apple will remain the dominant tablet vendor in the near future, with the launch of iPad 2 and iOS updates to address expanding user needs. Microsoft will be in the tablet market in 2011, but its relatively shorter battery life and the limitations of touch applications in Windows 7 will likely limit significant share gains in the near term. However, several OEMs are building hybrid Windows 7 tablets with keyboards that could appeal to users looking for fully featured productivity applications (Office). We think that Microsoft will be much more competitive in the tablet market in 2012, when Windows 8 is released with ARM support, touch optimization, and, likely, a tablet-oriented application marketplace. Medium term, as tablets become more prominent in the enterprise, Microsoft has significant advantages in security, application compatibility, and management that will likely ensure a prominent role in the enterprise segment. Microsoft is the most challenged potentially, but it could have the most upside if it executes. We estimate that 29% of tablets cannibalizing the PC market would have a \$0.02-0.03 negative impact to EPS (about 1%) in 2011, and lost revenue from tablets may be more than offset by a strong enterprise.

Debate: How will tablet adoption affect demand for software outside of the OS market?

Our view: While growing demand for tablets will cannibalize some PC sales, tablets also will expand the total addressable market for software vendors, with significant opportunities in the following three areas:

- **Systems management.** While initial demand for tablets has been largely consumer driven, we expect tablets to move into enterprise over time. Enterprise use will require new software solutions for managing and securing the devices and may also accelerate adoption of desktop virtualization solutions as users access corporate systems from locations outside of the firewall. Citrix Systems and VMware are best positioned here.

- **Applications.** Tablets have more limited hardware resources than traditional PCs, and we see lightweight and/or Web-based applications adapted for this limitation. Adobe tools should benefit from the development of lightweight consumer applications for tablet devices; tablets could also drive adoption of software-as-service (SaaS) solutions from vendors like Salesforce.com, where mobile users could access the full application over the Web without overtaxing the tablet's more-limited hardware resources. QLIK Technologies is also an example of a robust business intelligence tool that has been optimized for tablets.
- **Security.** The proliferation of new devices creates a new set of security challenges that range from the creation of new endpoint models, to centralizing application security, to building deeper network security for applications moving to the cloud. We believe that some of the biggest opportunities will be found in mobile accruing to network security vendors: More than 80% of the CIOs in our recent CIO survey expect to increase spending on network security in 2011. Check Point Software Technologies and Fortinet are the best positioned on this front.

Best Positioned: VMware, Citrix Systems, Intuit, SuccessFactors, Salesforce.com

Potentially Challenged: Microsoft, Adobe

February 14, 2011
Tablet Demand and Disruption

Debate: How will tablet adoption affect Microsoft's Windows business and what is Microsoft's tablet strategy?

Windows 7, For Now...

While Microsoft will offer Windows 7 on tablets in 2011, Windows 7 was originally engineered for a desktop computing experience and not optimized for key tablet requirements like touch applications and low-power consumption. Windows Phone 7 (WP7), which has a genuine touch interface, a growing arsenal of third-party touch applications, and an applications store (Windows Phone Marketplace), seems like a better fit for the tablet form factor, but limitations on chassis specifications keep WP7 from being a possible solution.

Windows 7 tablets do support Microsoft Office, which could appeal to users looking to use a tablet as a true PC replacement, but we think that Microsoft must improve the experience of Office software on tablets to be a real differentiator. We have seen several manufacturers launch hybrid Windows 7 tablets with keyboards that make it easier to interact with key productivity applications like Word and Excel (exhibit 78). We also believe that Intel's Oak Trail (Atom system-on-a-chip) platform should reduce the power consumption and extend the battery life of Windows 7 tablets relative to previous x86 processors.

...and Cannibalization Impact Appears Limited

Even though Microsoft has more than 90% share of the PC market, we believe that tablet cannibalization will have a limited impact on Microsoft's revenue and earnings in 2011. If we assume a tablet cannibalization rate of 29% on PC sales in 2011, and Windows only captures about 5% of the tablet market, we estimate that tablets would reduce Microsoft's earnings by only \$0.02-0.03 in 2011, or approximately 1%. While the growth of tablets will be neutral to slightly negative for Microsoft in the near term, there are several offsetting factors:

- 1) Tablets disrupt low-end consumer netbooks. With the enterprise average selling price about two times higher than the consumer ASP (and three to four times the netbook ASP), strength in the enterprise can offset weakness from tablet cannibalization.
- 2) Windows 8 will likely be engineered specifically for the tablet form factor. Any incremental share will help offset the relatively small percentage of sales lost to cannibalization.

- 3) Enterprise traction for tablets is likely to benefit Microsoft.
- 4) Should tablets become more effective content-creation devices, Microsoft will benefit disproportionately because of its application suite.

Microsoft Should Be More Competitive with Windows 8

We believe that the upcoming release of Windows 8, expected in 2012, will likely represent the first mainstream commercial opportunity for Microsoft in the tablet space. Microsoft recently announced that Windows 8 will support SoC architecture from ARM, in addition to the next generation x86, which will reduce power consumption and improve the battery life of Windows tablets. Importantly, we believe that Windows 8 will likely be engineered specifically for tablets, with improved touch support, and we expect Microsoft to launch a dedicated application storefront.

Exhibit 78

Windows 7 Tablets from Tier 1 Vendors All Have Hybrid Keyboard or Stylus

Brand	Name	OS	Display	Processor	Hybrid Keyboard	Stylus
Dell	Inspiron Duo	Win7	10"	Intel Atom	Y	N
HP	Slate	Win7	8.9"	Intel Atom	N	Y
Acer	Iconia	Win7	10"	AMD Fusion	Y	N
Asus	Eee Slate	Win7	12"	Intel Core i5	N	Y
Samsung	PC 7	Win7	10"	Intel Oak Trail	Y	N

Source: Company data, Morgan Stanley Research

Criteria for a Successful Tablet Operating System

Many of the key characteristics of a successful tablet OS, in our view, are consistent with those required on a smartphone, given the similarities of mobility, touch optimization, power consumption, and usage patterns (content consumption versus content creation). We see two determinants of a successful tablet OS:

- a) The OS should be specifically created/adapted for the tablet form factor with the following characteristics:
 - Optimized for multi-touch (rather than for mouse and keyboard)
 - Low power requirements (more than 10 hours of battery life)
 - Ability to multi-task
 - Instant on/off
- b) Substantial breadth of applications available, with robust toolkits for developers

February 14, 2011
Tablet Demand and Disruption

We do believe that over time tablet usage patterns will likely evolve from their main use of content consumption today toward content creation, and consumers will likely require more fully featured productivity applications (exhibit 79).

Exhibit 79

Mobile OS by Key Characteristics

Name	Creator	Supported CPU Arch.	Cost	Touch Enabled	Multi-tasking	Flash Enabled	App Store
iOS	Apple	ARM	Bundled with hardware	Yes	Yes	No	App Store
Android	Google	ARM, MIPS, Power Architecture, x86	Free and open source	Yes	Yes	Yes	Android Market
Windows 7	Microsoft	x86, x86-64	License fee-based	Yes	Yes	Yes	None
Windows Phone 7	Microsoft	ARM	License fee-based	Yes	Expected 2011	Expected 2011	Win Phone Marketplace
Blackberry Tablet OS	Research In Motion	ARM	License fee-based	Yes	Yes	Expected 2011	App World
WebOS	HP	ARM	License pending	Yes	Yes	Expected 2011	App Catalog

Source: Company data, Morgan Stanley Research

Apple Is Leader in the Near Term, with the Market Fragmenting in the Medium and Long Term

Apple’s iOS is the dominant tablet OS today and will likely remain so for the near term. Unlike traditional PCs, the iPad’s platform integrates the hardware and software (iOS) of the device, while Apple tightly controls the software that can be installed, requiring applications to be approved for download from the App Store. This tight integration allows Apple to create a differentiated and rich user experience: developers can target software for a single platform with consistent underlying hardware specifications, rather than for an operating system on multiple devices, where the underlying hardware can vary widely by manufacturer.

Today, the market for tablet operating systems structurally resembles the market for PC operating systems, with one dominant vendor (Windows in PCs and Apple in tablets) capturing more than 90% of the market overall. Microsoft has been able to dominate the PC OS market because many applications only run on Windows, and Microsoft has been willing to work with multiple PC manufacturers to develop a vibrant ecosystem around the Windows platform.

However, the smartphone market is more diverse, as Android handsets offer an open alternative to vertically integrated iPhone devices and content developers have shown a willingness to develop popular applications to multiple platforms. We expect competition to grow over time and the tablet market is likely to fragment, with a wide variety of tablet

devices running multiple operating systems that cater to different price points, end markets, and functional needs (exhibit 80).

Why Multiple Operating Systems?

Windows achieved and maintained 90% market share in the PC market, raising the question as to whether the iPad can do something similar in the tablet market. However, while we believe the iPad will be a big part of the tablet market, we expect other vendors to make inroads as well as they target different subsegments of the market, similar to what we have seen in other consumer electronics markets, like smartphones and game consoles.

In the phone market, Android was embraced by phone manufacturers as a means of competing with vertically integrated iPhones, while Blackberry and Windows Phones found initial success in the corporate world. In game consoles, Xbox was able to hone in on incumbent leader Sony PlayStation through strong titles like Halo and tools for game developers that were easier and richer to use, while Wii was able to cater to markets outside of the traditional gamer with a different user experience. We think that similar trends could emerge in the tablet world, with the iPad representing the aspirational brand (similar to the iPhone), while alternative platforms compete in other areas, such as openness, developer communities, user experience, breadth of form factors, and/or price.

Exhibit 80

No OS Owns All Key Content: Many Applications Are Offered on Smartphone Systems

	iPhone App Store	Android Market	Windows Marketplace	Blackberry App World	Palm App Catalog
Angry Birds	X	X			X
BeJeweled	X	X	X	X	X
Foursquare	X	X	X	X	X
Sudoku	X	X	X	X	X
Tetris	X	X	X	X	X
The Moron Test	X	X		X	
The Weather Channel	X	X	X	X	X
Twitter	X	X	X	X	X
Yelp	X	X	X	X	X

Source: Company data, Morgan Stanley Research

Competition from Android likely to heat up in 2011.

Android’s open-source software/hardware partnering strategy differs from Apple’s strategy of vertical integration and allows more OEMs to build on the platform. As a result, in 2011 there will likely be more tablets available on Android-based platforms than on all the other platforms combined, and they will offer Flash compatibility— currently not available on the

February 14, 2011

Tablet Demand and Disruption

iPad. However, questions remain whether the open platform also leads to greater fragmentation and less standardization as OEMs and carriers modify the OS in an effort to differentiate various devices.

Android has had numerous platform updates (five total, from 1.5 to 2.3) and while Google has made efforts to address compatibility issues, there are still challenges related to testing and development across multiple devices. In addition, OEMs need to create custom user interfaces to the Android OS to differentiate the product, but it is unclear if OEMs have the development or engineering capabilities to design a compelling and rich user interface comparable to the iOS. After offering smartphone-centric Android 2.2 on tablets over the last year, Google has just released an official tablet OS called Android 3.0 Honeycomb. This tablet OS was built specifically for the tablet form factors and appears to have a newly designed user interface and native applications.

Additionally, we expect to see new offerings from Research In Motion, with its tablet OS on the BlackBerry Playbook, as well as from Hewlett-Packard, with Palm's webOS offered on several tablet devices in 2011. Research in Motion is expected to debut its BlackBerry Playbook March 2011, which will likely appeal to enterprises, given its Blackberry-installed base and its trusted enterprise security and manageability. Hewlett-Packard's webOS tablets will likely take a more consumer-oriented approach, although at this point it is unclear how the company can differentiate from the iPad and Android devices.

Tablet OS Market Share Scenario Analysis

Apple is likely to maintain market share leadership in the near term, but we also expect increasing fragmentation over time, similar to that of the smartphone market. To better illustrate potential outcomes over the next two years, we present a tablet OS market share scenario analysis (exhibits 81 and 82).

We base our assumptions—that Microsoft will face a \$0.02-0.03 EPS impact in 2011—on our base case forecast of 5% Windows market share in tablets. We assume that the Windows OS on a tablet will garner approximately the same price point as it does on a cannibalized unit, but that assumption may be conservative, given that we expect netbooks to be the most affected by cannibalization, and Windows on a netbook has a 30-40% lower ASP than on a traditional notebook.

Scenario A— iOS maintains tablet market leadership. iOS, 65% share; Android, 25% share; Windows, 5% share; and Blackberry Tablet OS and WebOS, 2.5% share each.

Scenario B— tablet OS is similar to the high-end consumer smartphone market. Android, 48%; iOS, 34%; Windows, 13%; Blackberry Tablet, OS 4%; and WebOS, 1%.

Scenario C— tablet OS fragmentation. Windows gradually increases share to 27% by 2012; Apple and Android garner 27% share in 2012; Blackberry Tablet OS and WebOS claim approximately 10% each.

February 14, 2011
Tablet Demand and Disruption

Exhibit 81

Microsoft Windows Will Experience Much of the Impact of Cannibalization...

	Cann. Share	Cannibalized Units			Scenario A		Scenario B		Scenario C	
					Incremental Tablets		Incremental Tablets		Incremental Tablets	
		2011	2012	Total	2011	2012	2011	2012	2011	2012
Tablet OS										
Windows	96%	15	22	37	3	4	6	10	10	23
iOS	4%	1	1	2	41	55	33	30	28	23
Android	0%	0	0	0	8	21	15	43	11	23
Blackberry Tablet OS	0%	0	0	0	1	2	1	2	3	8
WebOS	0%	0	0	0	1	2	1	1	3	8
Total	100%	16	23	39	55	85	55	85	55	85
Tablet OS Market Share										
Windows					5%	5%	10%	12%	18%	27%
iOS					75%	65%	60%	35%	50%	27%
Android					15%	25%	27%	50%	20%	27%
Blackberry Tablet OS					3%	3%	2%	2%	6%	10%
WebOS					2%	2%	1%	1%	6%	10%
Total					100%	100%	100%	100%	100%	100%

Source: Company data, Morgan Stanley Research estimates

Exhibit 82

... but Total EPS Impact Should Be Small, Offset by Incremental Share Gains by 2012

MSFT Revenue Impact	Cannibalized Units			Scenario A		Scenario B		Scenario C		
				Incremental Tablets		Incremental Tablets		Incremental Tablets		
	2011	2012	Total	2011	2012	2011	2012	2011	2012	
Windows Market Share										
Windows Units	15	22	37	3	4	6	10	10	23	
Windows ASPs	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	\$40	
MSFT Rev. Impact	600	897	1,497	(489)	(727)	(379)	(488)	(202)	23	
MSFT EPS Impact				(0.03)	(0.05)	(0.03)	(0.04)	(0.01)	0.00	

Source: Company data, Morgan Stanley Research

Debate: What are the other software opportunities in tablets?

New devices and more sophisticated threats drive increasing demand for security solutions.

Key beneficiaries: Symantec, Check Point, Fortinet

The proliferation of new devices creates a new set of security challenges that range from the creation of new endpoint models, to centralizing application security, to building deeper network security as more applications move to the cloud. Security is a source of concern with the Android platform as Google has not taken an active part in policing the content available through the Android market and has advocated an

open system, where applications (potentially malicious applications) can be easily downloaded to an Android device.

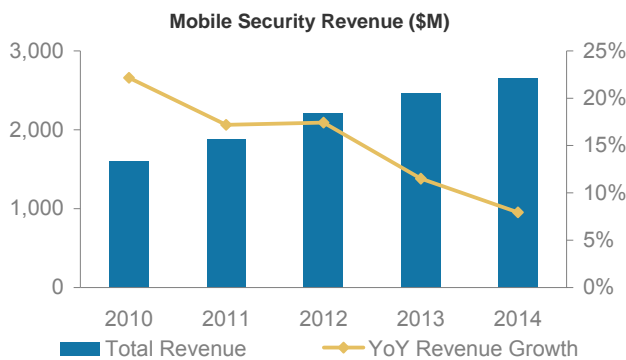
In response to growing vulnerabilities, mobile security solutions for the enterprise are emerging (exhibit 83). They focus mainly on enterprise data protection, including functionality, such as authentication, encryption, and the ability to remote-wipe data from a device. Some traditional endpoint security vendors are developing or acquiring mobile security solutions, and several pure-play mobile security vendors like Lookout Mobile Security are starting to appear. McAfee recently acquired VirusScan Mobile and TenCube, both of which expanded McAfee's mobile security offerings,

February 14, 2011
Tablet Demand and Disruption

and Symantec recently introduced Norton Everywhere, which includes Norton Mobile Security for Android.

We see some of the biggest opportunities, however, accruing to network security vendors in the enterprise space; more than 80% of the CIOs interviewed in our recent CIO survey expect to increase spending on network security in 2011, making network security for the enterprise one of the focus areas in the software industry. One good example: network security vendor, Check Point, currently offers a mobile access software blade that provides secure encrypted communication, authentication, and remote wipe for the iPhone and iPad, with support for Android coming soon.

Exhibit 83
Mobile Security Revenue Growth on Track to Exceed 15% in 2011-12



Source: IDC

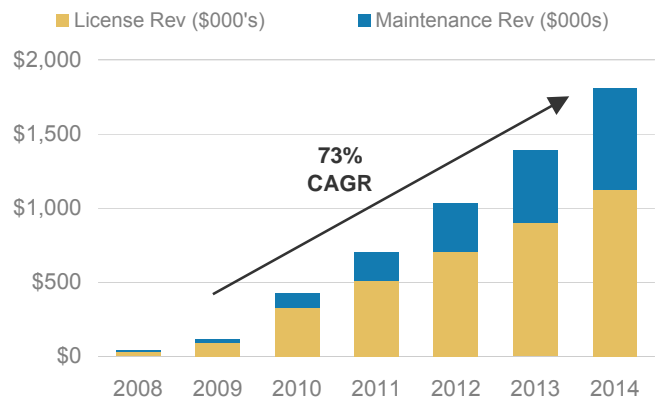
Growing corporate tablet use requires new tools for device management and is an added driver for virtual desktop infrastructure.

Key beneficiaries: VMware, Citrix, Microsoft

While the early success of tablets has been in the consumer world, corporate interest in tablets has grown as well. But bringing these devices into the corporate domain creates a new set of challenges and opportunities for systems management software vendors. Based on our AlphaWise US consumer tablet survey, 62% of tablet consumers leverage tablets to read email, while another 21% use tablets for content creation. To access corporate email, applications, or content, users will likely have to have those capabilities made available in an environment that corporates can manage from behind the firewall. This creates opportunities for Microsoft to deliver, host, and manage cloud-based service and/or email, which can be accessed equally from a traditional PC within the firewall or a mobile tablet from a remote location.

We also see tablets as an added catalyst for desktop virtualization as business users look to access their work applications (many of which only run on Windows) on a device that may not be powered by Windows (exhibit 84). Desktop virtualization helps business users access work systems from a tablet, while still allowing IT administrators to centrally control access to and secure corporate systems from within the firewall. The linkage between mobile computing devices and desktop virtualization is already apparent, with Citrix recently reporting that their Citrix Receiver was downloaded 1.8 million times in 2010, across an array of laptop, tablet, and smartphone platforms. We look for the overall VDI market to grow more than 60% in 2011, and for Citrix, VMware, and Microsoft to be the key beneficiaries.

Exhibit 84
Desktop Virtualization Market Set to Grow More than 60% in 2011, and to Reach \$1.8B in 2014



Source: Company data, Morgan Stanley Research

As mobile devices are increasingly being used to access business-critical applications, enterprises will need to focus on ensuring secure user access and system availability across these mobile devices. Mobile device management software can address some of these issues, with functionality that includes provisioning, configuration management, and remote control. Market research firm IDC estimates that the mobile device management market will grow at a 7.6% CAGR from 2009-14. The market for mobile device management is made up of traditional systems management vendors, such as CA Technologies, BMC Software, and Microsoft (which generally extend their desktop offerings to include support for mobile devices), mobile enterprise application platform companies, such as Sybase/SAP, and smaller pure-play vendors, such as Odyssey Software. Finally, tablets have limited storage capabilities—which creates a new set of opportunities for online storage and backup vendors like Symantec.

February 14, 2011
 Tablet Demand and Disruption

Applications May Be the Biggest Opportunity

Key beneficiaries: SuccessFactors, Intuit, Salesforce.com, Adobe

The quality and breadth of available applications will be a key differentiator in the tablet OS market. The more limited hardware resources of a tablet device may also affect how applications are developed, deployed, and consumed.

Apple has the most developed application ecosystem, with more than 350,000 total applications and more than 60,000 applications optimized specifically for the iPad. The Android market is growing, however, and is a draw for developers that value both the openness and flexibility of the platform (applications do not require the approval of the vendor/carrier) and the ability to reach a wide breadth of consumers across multiple devices (exhibit 85).

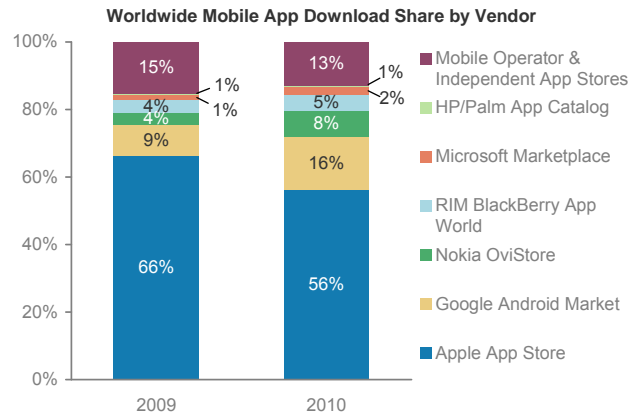
The Android market already has more than 130,000 applications for phones, many of which will likely be ported to the tablet form factor. Some of the most popular applications are built with Adobe, and the company continues to evolve its platform and model to benefit more directly from tablets. Additionally, we are seeing a new breed of software company, like Zynga and PopCap, that have built very large user bases and businesses around brands like Farmville and Angry Birds.

While Windows 7 tablets will run applications originally designed for the desktop OS, we think that a tablet application store will likely come in the next version of Windows and that the company may be able to leverage its growing Windows Phone 7 application ecosystem. Microsoft recently confirmed that it has more than 5,500 WP7 applications available through Windows Phone Marketplace, and this application store is currently growing faster than the Android marketplace did at launch.

While the breadth of WP7 applications available today still pales in comparison to the number of applications currently available for Android and iOS, Microsoft is leveraging its large community of .NET and Visual Studio developers (about 9 million) to build out the platform, and 20,000 WP7 developers are already registered.

Exhibit 85

Apple's App Store Is the Dominant App Vendor but Other Vendors Are Increasing Share



Source: IDC, Dec. 2010. Note: Microsoft Marketplace includes Apps for Windows Mobile and Windows Phone 7

Consumers drove the early adoption of tablet devices and the development of their applications, but corporate interest in the tablet is growing, and we believe that this interest will add a new wrinkle to how applications are consumed on tablet devices.

Tablet devices are designed for portability, long battery life, and ease of use, and they tend to have more limited underlying hardware as a result. While lightweight consumer applications may not exceed the limits of tablets, data-intensive enterprise applications may, which means that moving traditional enterprise desktop applications over to tablet devices may require a new approach. We think cloud computing provides an attractive solution, because a lightweight web client is unlikely to tax tablet hardware, and all of the data residing on the backend server can be accessed over the internet, while remaining centralized and secure if the client device gets lost.

Salesforce.com should be a beneficiary of the move toward cloud-based applications, and it has some of the most popular enterprise tablet applications. SuccessFactors and Concur also have emerging stories here. We expect to see more enterprise applications developed for tablet use, from companies like SAP and Oracle (with Fusion).

Additionally, we have seen business intelligence applications from QLIK Technologies and MicroStrategy gain early success, and we believe dashboards are a natural use case for tablets. Over time, we expect more business applications to be available on tablets, and we think this will become a

February 14, 2011

Tablet Demand and Disruption

point of differentiation for Windows devices as business customers want Office on their tablets.

While tablet usage is clearly geared towards content consumption, our AlphaWise survey suggests that consumers still need traditional productivity applications (like Microsoft Office). Following their tablet purchase, tablet owners reported a PC usage increase (net of decreased usage) of 3% for creating or editing documents for personal use, 8% for general work applications, and 12% for job-specific work applications (exhibit 86). The 12% increase in work applications is significant, especially given a selection bias inherent in the question (more negative responses than positive).

Exhibit 86

Respondents Reported a 12% Net Increase in Usage of Work Apps on a PC after Purchasing a Tablet

How Has the Amount Of Time Spent On Your Laptop/Netbook Changed Since You Purchased A Tablet?

PC Usage by Task	More Time	About the Same Time	Less Time	Net Increase / Decrease in Usage
Personal - Web browsing	23%	43%	34%	-11%
Personal - Email	22%	48%	31%	-9%
Personal - Social networking	17%	38%	31%	-14%
Personal - Reading e-Books, newspapers or mags.	17%	26%	28%	-11%
Personal - Playing games	11%	40%	32%	-22%
Personal - Listening to music	18%	12%	23%	-5%
Personal - Watching video	22%	25%	25%	-3%
Personal - Taking pictures or recording video	14%	28%	17%	-3%
Personal- Creating or editing files/documents	23%	45%	20%	3%
Work Use - General applications	22%	46%	14%	8%
Work Use - Job-Specific applications	26%	35%	14%	12%

Source: AlphaWiseSM, Morgan Stanley Research

To the extent that content creation becomes a bigger part of the tablet story, Microsoft stands to be the biggest beneficiary with its Office suite, while Adobe has several plays through Knowledge Worker and Creative Suite. Content creation will require that legacy applications evolve to accommodate smaller touch screens, however, and ultimately it will require more cloud-based capabilities.

MORGAN STANLEY BLUE PAPER

Tablet Demand and Disruption

 **Interactive Entertainment**

Interactive Entertainment: Tablets Posied to Cannibalize Hardware

Collis H. G. Boyce
Mia Nagasaka
Masahiro Ono
Richard Ji
Timothy Chan, CFA

Interactive Entertainment Industry Key Debates.

Debate: How will tablet adoption affect the gaming hardware market?

Our view: Similar to other mobile devices, including smartphones and the iPod Touch, we think that a portion of tablet sales could cannibalize gaming hardware shipments. Based on the results of our AlphaWise survey, we estimate that 8% of tablet sales could cannibalize gaming hardware. This could reduce gaming hardware shipments by 6% in 2011 and 10% in 2013, with the impact intensifying if tablet shipments rise above 100 million in 2013. This would affect primarily the handheld gaming market, where there is more overlap in terms of mobility, screen size, and game play. We note that handheld gaming manufacturers are taking steps to differentiate their product offerings in the face of competition from mobile devices. In the near term, we expect the impact of tablet cannibalization on the industry to be muted because of Nintendo's 3DS product launch, which could partially offset cannibalization pressure.

Debate: How will tablet adoption affect the gaming software market?

Our view: While tablets provide a new platform for gaming developers, we believe that after considering cannibalization, the overall impact from tablet sales on gaming software revenue will be neutral at best, since tablet gaming have significantly lower average selling prices and many games are free. What's more, we see two potential incremental negatives for the gaming software market: 1) Potential downward pricing pressure on handheld and console gaming platforms, and 2) rising competition from new gaming software entrants. Still, there are clearly many mobile gaming developers that are benefiting from the growth in mobile devices.

Potentially Challenged: Nintendo, Sony

Riding iOS/Android Success to Tablets

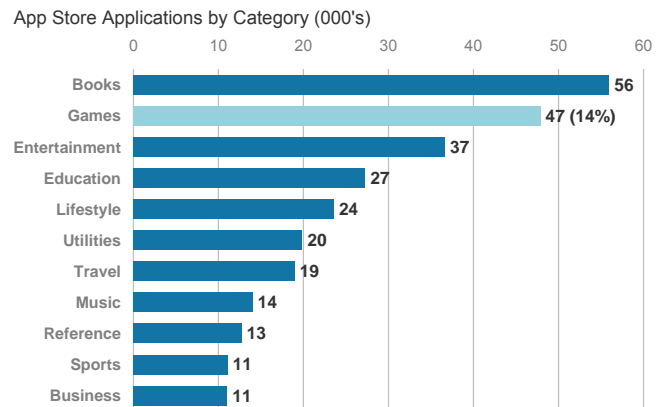
Gaming has been one of the most popular activities on mobile platforms—including iOS and Android—and there is mounting evidence that mobile gaming will achieve similar success as the platforms evolve from smartphones to tablets. Below, we discuss the success of gaming on mobile platforms, how tablet gaming differs from other mobile devices, and how rising tablet adoption could affect the gaming hardware and software markets.

Mobile Gaming Success

Gaming represents the second largest category of applications (after books) on the App Store, with approximately 47,000 available games, or 14% of total applications (exhibits 87 and 88). Importantly, gaming likely represents a much larger percentage of total application downloads, as the category dominates the download rankings. In January 2010, games represented 60% of the top-10 free application downloads and 90% of the top 10-paid applications on the App Store.

Exhibit 87

Gaming Category #2 with 47,000 available Apps on App Store...



Source: 148apps.biz, Morgan Stanley Research

February 14, 2011

Tablet Demand and Disruption

Exhibit 88

...but Gaming is much larger % of downloads

iPhone Top 10 Free Applications January 2011				
Rank	Title	Publisher	Category	Price
1	Ping Pong	Miniclip.com	Games	Free
2	Create a awesome lock screen	YoungGam Comm.	Utilities	Free
3	Stenches: A Zombie Tale	Thunder Game Works	Games	Free
4	BridgeBasher	Andrew Garrison	Games	Free
5	Farm Story: Valentine's Day	TeamLava	Games	Free
6	Paper Glider	Neon Play	Games	Free
7	Angry Birds Free	Rovio Mobile	Games	Free
8	Zombie Café	Capcom	Games	Free
9	Love Finger Scan	Indigo Penguin	Entertainment	Free
10	Sunday Lawn	Donut Games	Games	Free

iPhone Top 10 Paid Applications January 2011				
Rank	Title	Publisher	Category	Price
1	Angry Birds	Rovio Mobile	Games	0.99
2	Fruit Ninja	Halfbrick Studios	Games	0.99
3	Trenches	Thunder Game Works	Games	0.99
4	Tap DJ - Mix and Scratch	Laan Consulting	Music	1.99
5	Cut the Rope	Chillingo	Games	0.99
6	90 in 1: APPZILLA!	Fossil Software	Utilities	0.99
7	Doodle Jump	Lima Sky	Games	0.99
8	Angry Birds Seasons	Rovio Mobile	Games	0.99
9	Madden NFL 11	Electronic Arts	Games	4.99
10	Flick Golf!	Full Fat	Games	0.99

iPhone Top 10 Highest Grossing Applications January 2011				
Rank	Title	Publisher	Category	Price
1	Angry Birds	Clickgamer.com	Games	0.99
2	Tap Zoo	Pocket Gems	Games	Free
3	Dead Space	Electronic Arts	Games	6.99
4	Tap DJ - Mix and Scratch	Laan Labs	Music	1.99
5	Call of Duty: Zombies	Activision	Games	4.99
6	Zombie Farm	The Playforge	Games	Free
7	Tiny Chef	Brooklyn Packet	Games	Free
8	Fruit Ninja	Halfbrick Studios	Games	0.99
9	Zombie Café	Capcom	Games	Free
10	Plants vs. Zombies	PopCap Games	Games	2.99

Source: Distimo, Morgan Stanley Research

Besides strong representation in available applications and actual downloads, games are one of the highest-grossing application categories, driving developers to mobile platforms and prompting some M&A activity in the mobile gaming space. In 2010, mobile applications generated approximately \$4.9 billion of revenue, according to IDC. The mobile applications market will grow to more than \$37 billion by 2014, according to IDC, generating more than \$26 billion for application developers, assuming a 70% revenue share. While this forecast includes many other categories, the mobile application market, which is driven partially by gaming applications, is expected to grow more than seven times in the coming years.

This growing market is driving gaming developers to, and M&A activity in, the mobile gaming space. There have been several notable transactions recently that involved established companies, including Electronic Arts, and others, like Google and Disney, have acquired mobile game developers.

Social gaming are an important underlying trend across many mobile gaming and recent M&A transactions. Zynga has expanded onto mobile platforms and has an estimated private market value larger than that of Electronic Arts, Take Two, and THQ Inc. (exhibit 89).

Exhibit 89

Several Notable Mobile/Social Gaming M&A Transactions

Date	Acquirer	Target	Popular Mobile Titles	Deal Value (\$MM)
12/2/10	Zynga	Newtoy Inc.	Words with Friends	NA
10/20/10	Electronic Arts	Chillingo	Angry Birds, Cut the Rope	20
10/12/10	DeNA	Ngmoco	We Rule, We Farm	303
10/5/10	Zynga	Bonfire Studios		NA
8/30/10	Google	SocialDeck	Shake & Spell, Pet Hero MD	NA
8/5/10	Zynga	Unoh	Machitsukul, Band Yarouyo!	12
8/4/10	Google	Slide		179
7/27/10	Disney	Playdom	Social City, Sorority Life	563
7/1/10	Disney	Tapulous	Tap Tap Revenge	NA
2/22/10	Ngmoco	Freeverse Corp.	Skee-Ball	NA
10/15/09	Electronic Arts	Playfish	Word Challenge, Biggest Brain	300

Source: Company press releases, Morgan Stanley Research

The Gaming Experience Evolves from Other Mobile Devices to Tablets

As mobile gaming evolves from smartphones and the iPod Touch to tablets, the larger screen size and support from high-end gaming engine technology enables a more immersive gaming experience and will likely help to bridge the gap between mobile "casual" gaming and high-end console gaming.

Most popular mobile games—Angry Birds, Paper Toss, and Words with Friends, for example—have been "casual" by nature. Recently, more immersive games have come to mobile platforms, games such as Final Fantasy I/II/XIII, Street Fighter IV, Metal Gear Solid Touch, and Need for Speed. And Epic Games recently released Infinity Blade for the iPhone/iPad: The game is built on Epic's Unreal Engine 3 technology, a high-end-graphics, cross-platform gaming engine, which is the same as that used on consoles like Xbox 360 and PlayStation 3 (exhibit 90).

Ten days after its release in early December, there were about 300,000 Infinity Blade users registered on Apple's multiplayer GameCenter platform. At an ASP of \$5.99, this game likely generated about \$2 million in sales in just those first 10 days. With the eventual emergence of higher-end "hardcore" gaming on mobile platforms, we expect other developers to take advantage of the larger screen size and high-end-graphics technology available in tablets.

February 14, 2011
Tablet Demand and Disruption

Exhibit 90

**Infinity Blade: First Unreal Engine 3 Game:
~\$2 Million in Sales in Its First 10 Days**



Source: Epic Games, Gamasutra.

Mobile Devices Already Affecting Gaming Handheld Market

Global handheld game sales have been weak recently, despite the launch of the Nintendo DSi XL, which lends credence to the notion that smartphones and the iPod Touch are negatively affecting sales (exhibit 91). We acknowledge that there are other factors at work here, including an aging handheld product cycle and a challenging economy, but we attribute the market weakness in part to the adoption of mobile devices.

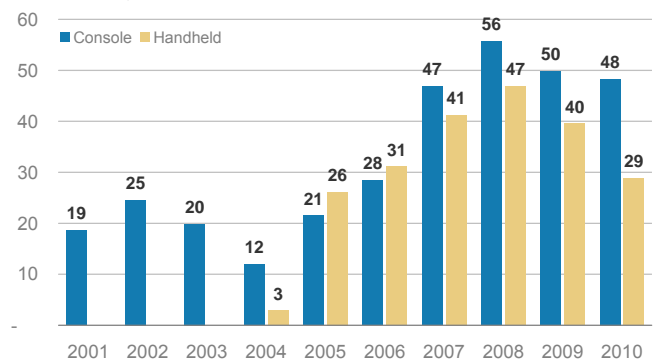
On a trailing 12-month basis through the third quarter of 2010, handheld hardware sales were down 25% year over year, while console hardware sales were up 3% (high-definition console sales were up 19%, and Wii and PlayStation 2 sales down a combined 8%). As gaming for

mobile platforms continue to improve, we believe that this pressure could increase and might affect console sales.

Exhibit 91

Handheld Shipments Much Weaker than Consoles

Annual Gaming Hardware Shipments, 2001-2010e, millions



Source: Company filings, Morgan Stanley Research estimates

Tablet Cannibalization to Reduce Gaming Hardware Shipments

Based on our AlphaWise survey, we believe that 8% of tablet sales will cannibalize the gaming hardware market (exhibit 92). While this rate is not high, the expected size of the tablet market relative to the gaming hardware market (85 million tablet shipments in 2012 versus 87 million gaming handhelds and consoles) means that it could have a material impact on certain segments of the market in the coming years.

Our analysis suggests that an 8% cannibalization rate could reduce gaming hardware shipments (handhelds and consoles) by 6% in 2011. This impact will likely increase as tablet shipments surpass 100 million in 2013. The cannibalization impact rises to 10% in 2013 for units.

February 14, 2011

Tablet Demand and Disruption

Exhibit 92

Gaming Hardware Tablet Cannibalization Analysis

	2009	2010	2011	2012	2013
Gaming Hardware Shipments					
Shipments, gross					
DS	28.9	20.0	28.9	29.3	26.5
PSP	10.4	7.9	7.1	14.5	13.5
Wii	22.2	18.1	9.6	19.5	22.7
PS	19.4	21.0	16.1	12.1	9.7
Xbox 360	8.2	12.2	13.2	11.9	8.9
Total	89.1	79.1	74.9	87.3	81.3
Cannibalization					
DS	-	0.7	2.8	3.6	4.3
PSP	-	0.3	0.7	1.8	2.2
Wii	-	0.1	0.2	0.6	0.9
PS	-	0.1	0.4	0.4	0.4
Xbox 360	-	0.1	0.3	0.4	0.4
Total	-	1.3	4.4	6.8	8.2
Cannibalization rate	8%	8%	8%	8%	8%
Tablet Shipments	-	16	55	85	102
Cannibalized units	-	1	4	7	8
Cannibalization Share					
DS	-	58%	64%	54%	53%
PSP	-	22%	16%	26%	27%
Wii	-	7%	5%	9%	11%
PS	-	8%	8%	6%	5%
Xbox 360	-	5%	7%	5%	4%
Total	-	100%	100%	100%	100%
Shipments, net					
DS	28.9	19.2	26.1	25.7	22.2
PSP	10.4	7.6	6.4	12.7	11.3
Wii	22.2	18.0	9.4	18.9	21.8
PS	19.4	20.9	15.7	11.7	9.3
Xbox 360	8.2	12.2	12.9	11.5	8.5
Total	89.1	77.8	70.5	80.5	73.2
Cannibalization Impact (Units)					
Handheld	0%	-4%	-10%	-12%	-16%
Console	0%	0%	-2%	-3%	-4%
Total	0%	-2%	-6%	-8%	-10%

	2009	2010	2011	2012	2013
Gaming Hardware Revenue					
Revenue, gross					
DS	4,050	3,051	6,779	5,652	4,094
PSP	2,011	1,553	1,591	4,938	4,388
Wii	4,983	3,569	1,555	4,611	4,809
PS	4,893	5,071	3,766	2,599	1,942
Xbox 360	2,088	2,876	2,857	2,212	1,437
Total	18,024	16,120	16,548	20,012	16,669
Cannibalization					
DS	-	113	666	703	668
PSP	-	57	156	614	716
Wii	-	18	35	145	190
PS	-	25	86	82	77
Xbox 360	-	14	65	69	57
Total	-	227	1,008	1,613	1,707
Cannibalization rate	8%	8%	8%	8%	8%
Tablet Shipments	-	16	55	85	102
Cannibalized units	-	1	4	7	8
Cannibalization Share					
DS	-	50%	66%	44%	39%
PSP	-	25%	16%	38%	42%
Wii	-	8%	4%	9%	11%
PS	-	11%	8%	5%	4%
Xbox 360	-	6%	6%	4%	3%
Total	-	100%	100%	100%	100%
Revenue, net					
DS	4,050	2,939	6,113	4,949	3,426
PSP	2,011	1,497	1,435	4,323	3,672
Wii	4,983	3,551	1,520	4,466	4,619
PS	4,893	5,046	3,680	2,518	1,865
Xbox 360	2,088	2,861	2,792	2,143	1,380
Total	18,024	15,894	15,540	18,399	14,962
Cannibalization Impact (Revenue)					
Handheld	0%	-4%	-10%	-12%	-16%
Console	0%	0%	-2%	-3%	-4%
Total	0%	-1%	-6%	-8%	-10%

Source: Company filings, Morgan Stanley Research

PS figures include PlayStation 3 and PlayStation 2, PSP includes PSP and PSP NGP (2011)

DS includes 3DS(2011), Wii includes Wi2(2012)

Importantly, we expect the cannibalization to be focused on the handheld gaming market, since there is more overlap in terms of mobility, screen size, and graphics capabilities. We allocate 80% of the cannibalization to handhelds. The handheld segment bears the majority of the tablet cannibalization burden as units are reduced by 10% in 2011, assuming an 8% cannibalization rate. This impact rises to 16% in 2013.

We would note that handheld gaming manufacturers are taking steps to differentiate their product offerings in the face of rising competition from mobile devices. Nintendo is poised to launch the 3DS, featuring 3D graphics, while Sony is planning to launch the successor to its PSP (code named NGP, for "next-generation portable") with specifications including a five-inch OLED screen, front and rear touch panels, and WiFi+3G capability. Consoles are more differentiated from mobile gaming platforms, in our opinion, due to graphics capabilities, multi-player functionality, and motion sensor controllers. In the near term, we expect the tablet cannibalization impact to be muted due the Nintendo 3DS and PSP NGP product cycles that will likely offset cannibalization pressure. Longer term, we expect to see a more pronounced impact from tablets in 2012 and beyond.

Tablets Neutral at Best for Gaming Software

Tablets are incremental to the total addressable market in term of gaming units, since we assume a cannibalization rate of only 8%. What's more, tablets represent a new platform for gaming developers. However, after considering cannibalization, the overall impact of tablet sales on gaming software revenue appears to be about neutral, since tablet games have significantly lower average selling prices and many games are free. Still, there are clearly many mobile gaming developers who are benefiting from the growth in mobile.

Below we present a sensitivity analysis for tablet gaming software revenue potential (exhibit 93). We assume 55 million and 85 million tablet shipments in 2011-2012 and a range of paid gaming downloads per tablet and average selling prices. At the middle of the range, tablets could generate approximately \$500 million of revenue in 2011 and \$800 million in 2012.

Exhibit 93

Tablet Gaming Revenue Potential (millions)

		Estimated Mobile Gaming Revenue From Tablets, 2011						
		Paid game downloads per tablet						
		4	5	6	6	7	8	9
ASP (paid only)	0.75	181	207	233	259	298	337	376
	1.00	242	276	311	345	397	449	501
	1.25	302	345	389	432	497	561	626
	1.50	363	415	466	518	596	674	751
	1.75	423	484	544	605	695	786	877
	2.00	484	553	622	691	795	898	1,002
	2.25	544	622	700	777	894	1,010	1,127

		Estimated Mobile Gaming Revenue From Tablets, 2012						
		Paid game downloads per tablet						
		4	5	6	6	7	8	9
ASP (paid only)	0.75	280	319	359	399	459	519	579
	1.00	373	426	479	532	612	692	772
	1.25	466	532	599	666	765	865	965
	1.50	559	639	719	799	918	1,038	1,158
	1.75	652	745	839	932	1,072	1,211	1,351
	2.00	745	852	958	1,065	1,225	1,384	1,544
	2.25	839	958	1,078	1,198	1,378	1,557	1,737

Source: Morgan Stanley Research

However, if you consider the lost software revenue from the cannibalized units that come with the significantly higher ASPs, it more than offsets the tablet revenue opportunity. We assume that cannibalized games have an average selling price of \$25 (consistent with handheld gaming prices on DS and PSP), which compares with the average paid tablet game price of approximately \$1.50. We estimate that the gaming software revenue potential for a handheld gaming device such as a DS or PSP is 17 times higher than that for a tablet (exhibit 94).

Exhibit 94

Tablets Are About Neutral for Total Software Sales

	2011	2012
Cannibalized Units (M)	4	7
Games per device	5	5
Game ASP (\$)	25	25
Cannibalized Revenue (\$M)	553	852
Tablet Game Revenue (\$M)	518	799
Net Revenue Impact (\$M)	(35)	(53)

Source: Morgan Stanley Research

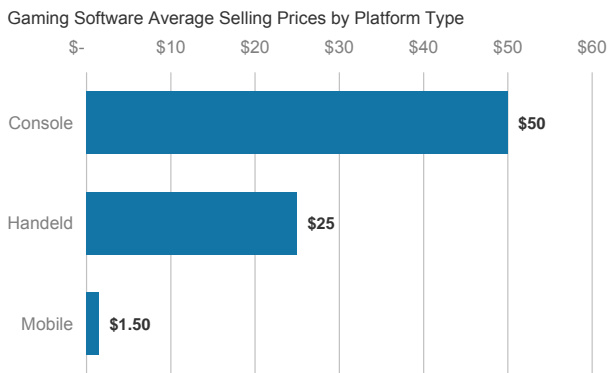
What's more, we see two potential incremental negatives for the gaming software market: 1) potential downward pricing pressure on handheld and console gaming platforms, and 2) rising competition from new gaming software entrants.

February 14, 2011
Tablet Demand and Disruption

As competition intensifies in the gaming market, pricing pressure from mobile gaming has the potential to cut into revenue from the handheld and console gaming software markets over the medium/long term.

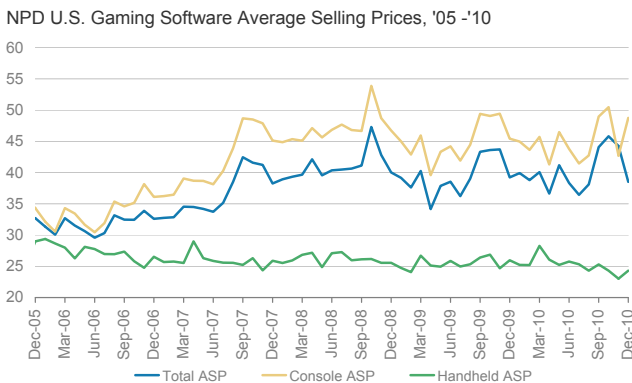
Interestingly, we have not seen much pricing pressure in gaming software markets over the last few years. Console game pricing is actually up and handheld pricing is about flat in recent years. We are unsure if this trend is sustainable, however, and think that there could be pricing pressure in the coming years as mobile gaming platforms increase in adoption and capability (exhibits 95 and 96). We would note that as more immersive games migrate to mobile platforms, there is likely to be some upward pressure on mobile gaming ASPs because development costs could increase (currently at about \$25,000-500,000); but we still expect there to be a wide gap between mobile and traditional gaming platforms.

Exhibit 95
Pricing Differential Could Lead to Pricing Pressure



Source: NPD, Morgan Stanley Research

Exhibit 96
No Sign of Gaming Software Pricing Pressure...Yet



Source: NPD, Morgan Stanley Research

We also expect increased competition in the mobile gaming space from new entrants as new mobile platforms and distribution models offer widespread availability of software development tools and direct access to consumers via application marketplaces. Historically, smaller developers were at a disadvantage due to high development costs and lack of scale, but the combination of lower mobile development costs and distribution through App stores has lowered the barriers to entry.

Exhibit 97
Mobile Gaming Creates Opportunities for Non-Traditional Publishers

Company	Popular Mobile Titles
Booyah	MyTown
CrowdStar	Happy Island
DeNA	Rolando, We Farm, We Rule
Digital Chocolate	Millionaire City, MMA Pro Fighter, Tower Bloxx
Gameloft	Assassin's Creed, The Oregon Trail, Brain Challenge, UNO
Glu	World Series of Poker, Paperboy, Bonsai Blast
Halfbrick	Fruit Ninja
Handy Games	Anno, Devils and Demons, Shark or Die, Guns'n'Glory
Lima Sky	Doodle Jump
PopCap Games	Bejeweled, Peggle, Plants vs. Zombies
Rovi	Angry Birds, Cut the Rope
Zynga	FarmVille, Mafia Wars, Live Poker, Words with Friends

Source: Morgan Stanley Research

Vendor Positioning

In hardware, vendors with greater exposure to consoles and lower exposure to handheld gaming are relatively better positioned for rising tablet adoption. The two vendors with the largest exposure to handhelds are Nintendo and Sony.

On the software side, vendors with greater exposure to mobile gaming or limited exposure to handheld gaming platforms are relatively better positioned. The best positioned gaming software developers are private companies that are exclusively developing for mobile platforms (exhibit 97).

As we mention above, traditional game publishers such as Electronic Arts have acquired several private mobile gaming developers, but these businesses are small in comparison to their legacy businesses. Besides Electronic Arts, other traditional gaming publishers are currently publishing content for mobile platforms, including Square Enix, KONAMI, and Capcom, but the mobile gaming contribution for these companies remains limited at this time.

MORGAN STANLEY BLUE PAPER

Tablet Demand and Disruption



February 14, 2011
Tablet Demand and Disruption

Cable/Satellite: Tablets Unlikely to Drive Incremental Cord-Cutting

Benjamin Swinburne, CFA
David Gober

Cable/Satellite Industry Key Debates

Debate: Can tablets be a positive for the cable/satellite industry or will tablets drive incremental adoption of “over-the-top” video, leading to video cord-cutting?

Our View: With respect to video, we believe weak household formation is the primary driver of recently light video subscriber growth, rather than “cord-cutting,” where viewers cancel paid subscriptions in favor of free or lower-cost online content. Current OTT video offerings are not a strong substitute for pay-TV due to a lack of high-quality, comprehensive content. We acknowledge some cord-cutting risk and we have factored limited video cord-cutting into our forecasts (about 5% of pay-TV subscriptions over the next five years). However, we view cord-cutting risk is primarily due to OTT content distributed on the TV screen (rather than to secondary viewing devices such as tablets).

On the upside, tablets provide cable and satellite operators with a way to significantly improve their video search and navigation interfaces (a traditional product weakness) at relatively low cost, potentially enabling deeper video-on-demand offerings. We expect continued development of customized tablet applications in 2011.

In terms of broadband access from cable operators, tablets will likely drive increased broadband consumption in the home, benefitting cable. Increased broadband consumption could also serve as a partial hedge against video cord-cutting if operations transition toward usage-based pricing.

Best-positioned and potentially challenged: Too early. The cable industry, particularly those with DOCSIS 3.0 ultra-high-speed data, should benefit from broadband access revenues drawn from tablet-driven increases in broadband consumption. However, it is too early to establish the winners and the challenged based on which operators will utilize tablets to improve the customer experience and extend their current video offering. While DISH has already launched its TV Everywhere product that extends to tablets, it is unclear if the content owners will move to block that offering due to rights issues. The rest of the industry has yet to launch their tablet products, which we expect to be released throughout 2011.

No Risk That Tablets Drive Video Cord-Cutting

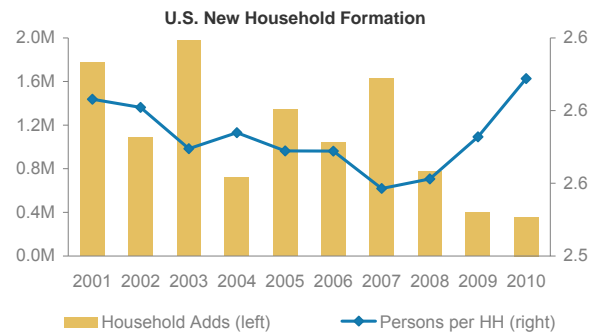
A key risk to traditional pay-TV operators is that OTT internet-delivered video sources ultimately become a substitute for traditional pay-TV, leading to video cord-cutting. While tablets may drive additional traffic to OTT sites, we believe the likelihood of subscribers canceling traditional pay-TV service specifically in favor of tablet viewing is very low. The more substantive threat to traditional pay-TV is from OTT video

products delivered to a traditional TV screen; however, we remain unconvinced that OTT will become a strong substitute for pay-TV. We continue to forecast that video cord-cutting will remain somewhat limited.

In our October 20, 2010 note, *Cable/Satellite: Over the Top and Far Away...*, we lay out our view that 1) the recent slowdown in the rate of new pay-TV subscriptions has been driven more by economic weakness than by video cord-cutting (exhibit 98); 2) over the next five years, video cord-cutting will be limited to about 5% of pay-TV subscriptions, as OTT providers prove unable to offer a competitive product, in part because of the high cost of content (exhibit 99); and (3) cable has a partial hedge against video cord-cutting via its broadband product.

Exhibit 98

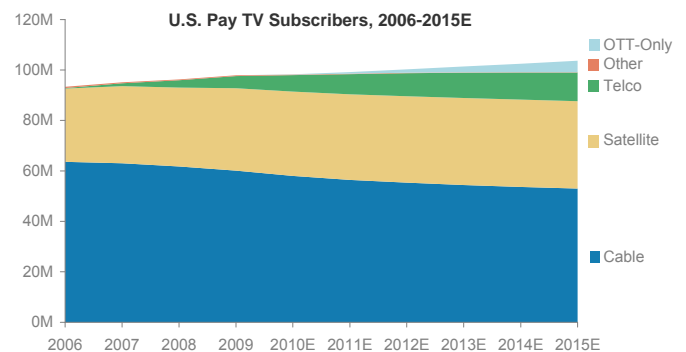
We believe low household formation is the primary driver of light video sub growth, not cord-cutting



Note: All data as of March of each year.
Source: US Census Bureau, Morgan Stanley Research

Exhibit 99

Lack of comprehensive/high-quality content limits cord-cutting to “fringe” ~5% of subs by 2015



Source: Company data, Morgan Stanley Research estimates

February 14, 2011
Tablet Demand and Disruption

Tablet Use to Drive High Bandwidth Broadband Video Consumption

A major theme in our cable/satellite research has been the rising consumption of broadband video in the home (exhibit 100). We believe this consumption will drive share gains and pricing power for cable's broadband offering, as cable typically offers superior speeds as compared with those of telecommunications companies (telco DSL offers median advertised speeds of roughly 3-4 megabits per second, and cable offers more than 10Mbps).

Cisco internet traffic estimates imply that the average US household will increase its consumption of broadband by 25-30% annually over the next five years, driven strongly by increased viewing of internet video. We believe this rapid usage growth will drive pricing power for cable's residential data products. Similar consumption growth has already put a strain on wireless networks, with a recent move by carriers to 1) usage caps and tiered pricing, and 2) broader deployment of WiFi coverage, likely limiting competition from wireless.

Broader tablet adoption is a key driver of in-home broadband consumption for two reasons:

- *Tablets drive consumption of high bandwidth internet-delivered video.* The tablet is a step-function improvement in the online video experience compared with either a smartphone or a PC. As the success of Netflix and other video applications shows, the consumer's appetite for video content on the tablet is high.
- *Tablets rely on WiFi connectivity, therefore (typically) a wireline broadband pipe.* A substantial portion of time spent on the tablet is in the home, as evidenced by the high percentage—roughly 55%—of WiFi-only iPads and by the fact that about 60% of iPod touch/iPhone use is over WiFi today. Since WiFi typically relies on a wired broadband connection, we believe the access provider offering the greatest speeds to the home is poised to win, and for most of the US, that is the cable industry.

Exhibit 100

Internet video drives broadband use: A household viewing only internet-delivered HDTV consumes ~20x more bandwidth than a typical HH today

Hours of TV viewing / day per TV HH	8.3
In seconds	29,880
x MPEG 4 HD Stream, Mbps	6
Total Megabits per HH per Day	179,280
Total Gigabytes per HH per Day	22
Per Month	657
Typical Wireline Internet Usage per HH (GB, 2009 average)	31
Increase	21.5x

Source: Company data, Morgan Stanley Research

Trends support cable's broadband share/pricing power...

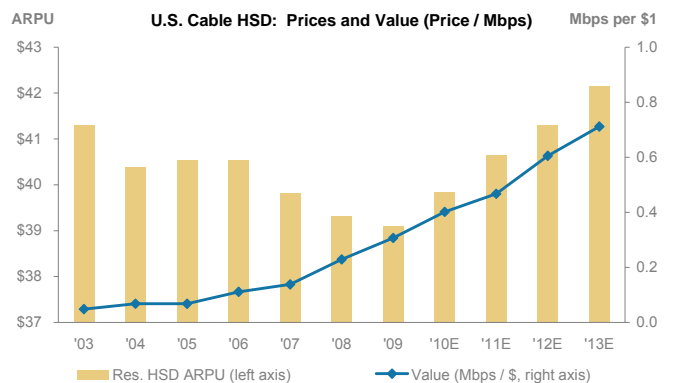
If we are right about cable's broadband advantage over DSL, cable's current market share of broadband households in the US should increase. While roughly 30-40% of US households can receive speed-competitive, fiber-based data services from AT&T and Verizon, the remainder are only able to get DSL and are increasingly moving towards cable's offerings. Given that cable's broadband product penetration is only 30-35% of homes passed by cable today, we see significant potential upside if rising usage puts DSL at a greater disadvantage.

In addition to potential share gains, we believe that rising broadband consumption should be supportive of cable's pricing power in broadband after multiple years of deflating data revenue per subscriber (exhibit 101).

For a more complete discussion, see our October 20, 2009 note, Cable/Satellite: After Years of Deflation, Broadband Pricing set to Rise.

Exhibit 101

Rising consumption and consumer value delivered help drive wireline broadband pricing power



Note: Standard tier download speeds, used to calculate "value," from SNL Kagan. Source: Residential ARPUs from company data, Morgan Stanley Research estimates.

February 14, 2011

Tablet Demand and Disruption

... and ultimately protection of cable's margins ...

For the cable operators, driving the broadband business is critical for two reasons. First, it helps offset share loss that continues in video as it competes with both satellite and telco-TV offerings. Second, gross margins on broadband are greater than 90%, versus roughly 55% for video, so the incremental impact on profitability is positive. As margins compress in the core video business, cable relies on a positive mix shift toward data products to protect overall margins.

...without a significant uptick in capital intensity.

With the deployment of a new generation of cable broadband technology (DOCSIS 3.0), cable is able to leverage its infrastructure to offer speeds of 50-100 Mbps (or higher), with minimal additional capital. This technology is being rolled out today and should reach full deployment by the end of 2012. In addition, we note that broadband is a much less capital-intensive investment for the marginal customer than is video; the average variable invested capital for a video customer is \$800-1,000, given three TVs per home—well below the \$300 for broadband.

Tablets Provide Platform for Improved Search and Navigation of Cable/Satellite Video Offerings

The ability to tie the iPad into the existing TV experience provides an additional opportunity for the cable/satellite industry. Already we are seeing the deployment of tablet-based search and navigation tools that tie directly to the set-top box. This should give the industry the opportunity to address perhaps its largest product weakness—a low-quality programming guide that lacks adequate searchability, which increasingly, in an iPad world, fails to meet consumer expectations. By leveraging smartphones and tablets already in the home, cable/satellite can provide a vastly improved navigation experience, with minimal capital outlays.

Furthermore, we note that integrated search capabilities should help pay-TV operators to offer much deeper video-on-demand offerings. VoD has traditionally been stymied by the consumers' inability to navigate through the "long-tail" of library content, limiting offerings to a smaller number of new release titles. By moving search and navigation to tablets, cable/satellite operators should be able to close the interface gap between them and web-based competitors like Netflix.

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Tablet Demand and Disruption



Media: A Game Changer for Content Owners

Benjamin Swinburne, CFA
David Gober

Media Industry Key Debates

Debate: How will tablet adoption affect content owners?

Our View: The tablet is a superior media consumption device relative to a PC or smartphone and, as a result, creates incremental opportunities to reach consumers.

For TV networks, tablets act as one more screen in the home and now, for the first time, on the road. This increase in audience creates additional advertising opportunities, as Nielsen moves to count online views in its ratings for the first time later this year. The challenge is building a consensus around how to build the economic model behind authentication, or “TV Everywhere.”

For movie studios, tablets have the potential to drive incremental rental activity and, perhaps down the line, help support the creation of a robust electronic-sell-through market. A consensus has yet to emerge, however, on key elements like file format, security, and pricing. Piracy is also a major risk to the studios as higher broadband speeds allow consumers to download large video files to these devices quickly.

For magazines, tablets offer the opportunity to thrive in a digital world where the PC has failed. Time spent on magazine websites is a fraction of the time spent with print magazines and, as a result, the transition to online has weighed on advertising and circulation trends. Tablet’s rich color and ability to recreate a true magazine layout with the added benefit of interactive content offers tremendous opportunity. **For newspapers,** there is a similar, albeit less incremental, positive.

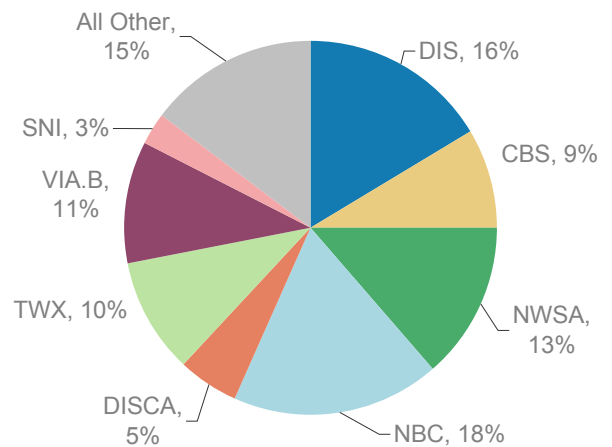
Best Positioned and Potentially Challenged: Early video consumption in tablets has led to value creation for both long-tail TV and film content (primarily distributed by Netflix) and broadcast TV shows (through Netflix and similar providers) with all the incremental value going to film and TV studios. Long-term, we expect companies that create and/or exclusively distribute content that reaches the largest and most passionate audiences will benefit – that includes broadcast TV shows and sports. That should benefit Disney, CBS, and News Corp. Companies with smaller audiences or that are primarily driven by syndicated content will likely see ratings and/or margin pressure as competition for content increases. Branded, niche networks such as Food Network or MTV have an opportunity to build audience through tablet applications that deepen the relationship with the viewer. It is too early to assess the level of success these applications may have.

How will tablet adoption affect content owners?

For TV networks, the tablet is about enhancing what is already a very attractive business model. Content owners with a large aggregate audience should benefit from incremental tablet views (exhibit 102). Today we are seeing broad experimentation regarding monetizing new distribution platforms. Major league baseball has leveraged its successful online subscription service to the iPad, and DirecTV, along with the National Football League, are now charging \$50 a month incremental for its Sunday Ticket customers to have access to the games streamed to a mobile device.

Exhibit 102

Seven companies receive 80-85% of TV Ratings – Content owners with large aggregate audience should benefit from incremental tablet views



Source: Nielsen, Company data, Morgan Stanley Research

There is a growing view among TV network owners that authentication (or its brand name, “TV Everywhere”) is the long-term solution. This model contemplates giving pay-TV customers free access to online content if they can be authenticated through a log-in and password. The complexity around this initiative is part technology/user-interface-related and part economics. We have already seen different approaches to how the consumer accesses the content, but presumably, a consensus will be reached over time.

The bigger question surrounds the economics of pay-TV, and most media companies agree that the consumer should not be asked to pay more for content already available on TV when accessing on a tablet. However, content owners are

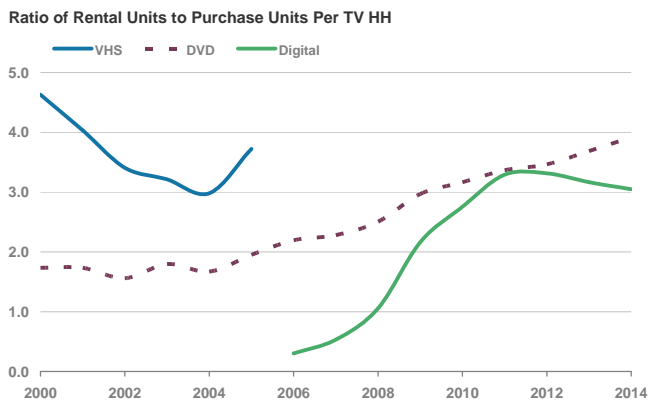
February 14, 2011
Tablet Demand and Disruption

looking for additional revenue from the cable/satellite operators as part of the authentication process. Given the growing number of content distribution models, we believe that over time content owners will receive additional revenue for the extended window.

For film studios, the tablet offers a clear opportunity to drive more rental activity and monetize its library titles, which have seen significant pressure from falling DVD sales. However, the long-term prize of a robust electronic sell-through model remains elusive.

The movie business—or, more specifically, the home video business—is in transition away from packaged sales to digital sales. Unfortunately, the consumer currently sees the digital film experiences as largely a rental experience (exhibits 103 and 104). For every lost sell-through transaction, a studio needs three to four rentals to be EBITDA neutral.

Exhibit 103
The ratio of rental units to purchase units will likely continue to increase over the next several years



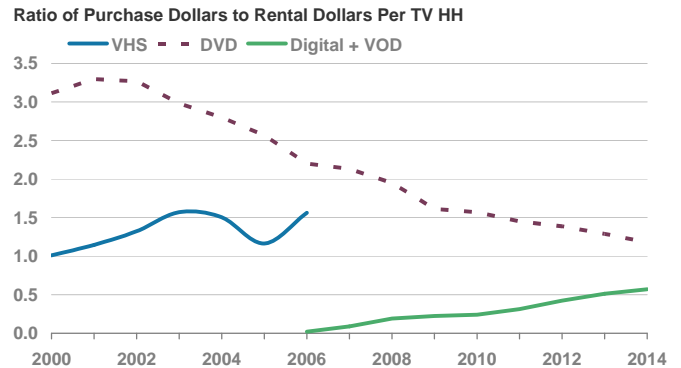
Source: Nielsen, Rentrak, Company data, Morgan Stanley Research

On a like-for-like basis, digital transactions are more profitable than physical transactions, given no manufacturing and shipping cost, but the consumer has yet to embrace “buying” digital movies. The tablet could enhance that opportunity if the studios reach a consensus on windowing both rental and rental subscription (Netflix, etc.) over time.

The Netflix agreement with movie network Epix, at \$900 million over five years, gives Netflix customers the ability to watch Epix films 90 days after the films reach the Epix TV window, or roughly 12-15 months after they hit the theater. While this library monetization is nicely accretive to Epix, studios do run the risk of making enough library content

available at low enough price points to dissuade the consumer from paying up to “own” or “rent on a per-use basis” films in an earlier window.

Exhibit 104
The ratio of purchase dollars to rental dollars will continue to fall



Source: Company data, Morgan Stanley Research estimates

For the print business, the tablet offers a step-function improvement in reader experience from the PC – particularly for magazines. Anecdotal data suggests that average time spent by magazine subscribers with the print copy is about an hour a month versus fewer than 10 minutes on the magazine’s website. The rich layout of a magazine does not translate to the traditional web experience. The tablet creates the opportunity to recapture that reader by delivering a digital magazine that not only includes the attractive elements of a magazine layout, but also offers interactivity and greater breadth and depth of experience than the print version.

Currently, the magazine industry has not reached consensus on how to price and distribute e-magazines. In addition, there is pushback against Apple’s preferred model of selling magazine subscriptions through iTunes, keeping the customer information from the publisher. This has been a major roadblock to broader distribution and availability of titles.

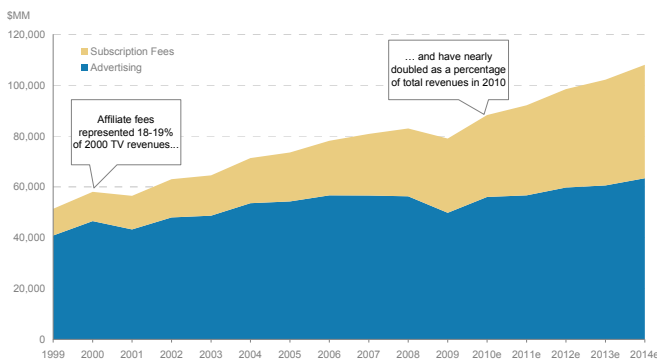
For newspapers, the tablet likely offers the industry an opportunity to re-assert a paid model online, which has largely failed, with a few exceptions, in the PC world. However, we believe that only national titles such as *Wall Street Journal*, *The New York Times*, and perhaps *USA Today*, with scale and unique content, will be able to drive a robust online subscription business. For local newspapers, we are cautious on potential upside.

February 14, 2011
Tablet Demand and Disruption

Market share implications: We believe that the share gainers will be the major brands with proprietary or premium content. In addition, media companies that package, price, and window their content appropriately will be able to drive the greatest incremental revenues. Ultimately, the incremental revenue opportunity for TV networks is probably limited, and the goal is to preserve the strong business model in place today. For the film studios, the key will be monetizing the library through tablet services without putting downward pressure on earlier window price points. For magazines, the tablet may be the last best chance at thriving in the digital media world.

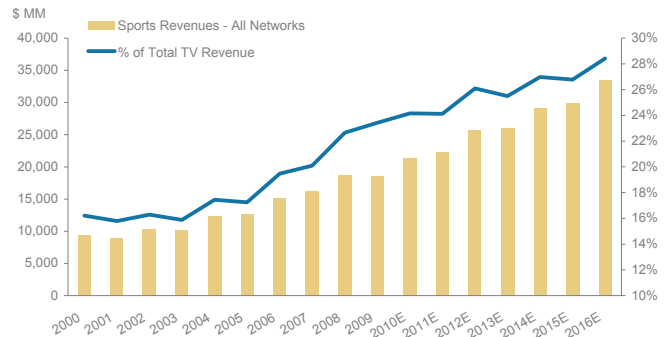
On the TV side, we believe sports and broadcast content (which aggregate the largest audience levels) will have the most success in driving incremental revenue. We believe, however, the tablet experience will accelerate a trend we have been seeing for years, as the TV business model moves away from advertising and increasingly towards subscription (exhibit 105). While ad skipping is not currently available on tablet TV viewing, technology and consumer choice are driving the model increasingly towards subscription payment methods.

Exhibit 105
Subscription fees now represent 35% of TV revenues and growing



Source: Company data, Morgan Stanley Research

Exhibit 106
Sports content accounts for ~20-25% of total TV revenues today and growing



Source: Nielsen, Rentrak, Company data, Morgan Stanley Research

For sports networks like ESPN and regional sports networks, the challenge will be holding down costs as more leagues and teams ask for additional payment for digital rights. We have already seen this impact in the NFL, which has sold some of its games to Verizon Wireless on an exclusive basis, separately from its existing agreement with DirecTV (exhibit 106).

For premium networks like HBO and Starz, we have seen different models emerge so far, but we are still in the early innings. Starz has opted to sell its content (and the Disney and Sony films it distributes) through Netflix, in effect becoming a wholesaler. HBO is moving towards the authentication model with its HBO Go platform, which will be bundled in with HBO TV subscriptions. Over time, we believe authentication will likely become the primary model for premium networks as wholesaling can put a network in direct competition with many of its largest customers.

For the film studios, we have also seen different approaches. Today, iTunes dominates the electronic sell-through market, but that market is very small. Netflix has created a very successful streaming service using primarily library movie content. This increased demand for library rights is a welcome relief to the film studios that have seen library DVD sales plummet over the last several years. The risk is that this low-priced subscription service leaves the customer satisfied and unwilling to pay up for earlier window film content.

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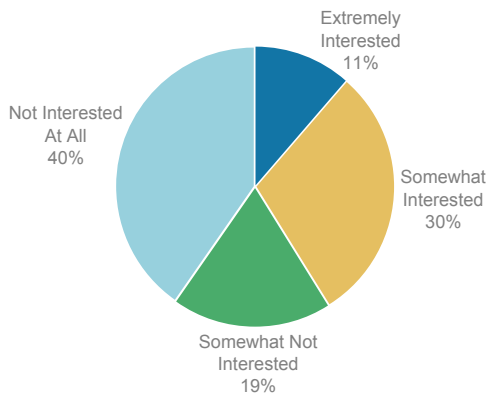
Tablet Demand and Disruption
Appendices

February 14, 2011
Tablet Demand and Disruption

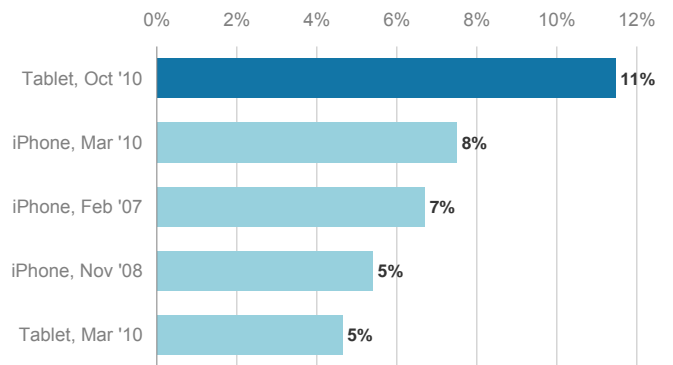
Appendix I: Key Survey Takeaways

Strong Tablet Purchase Intentions in the US

Tablet Purchase Intentions over the next 12 months, U.S.

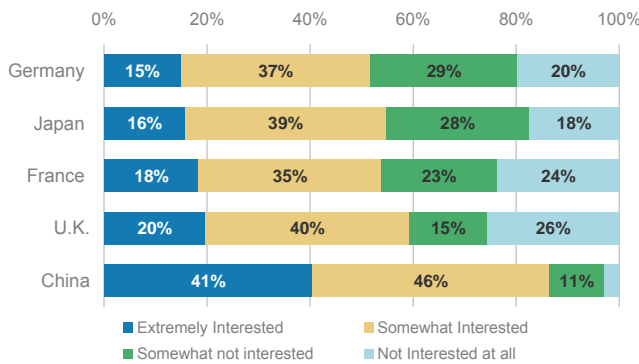


Consumer Intention

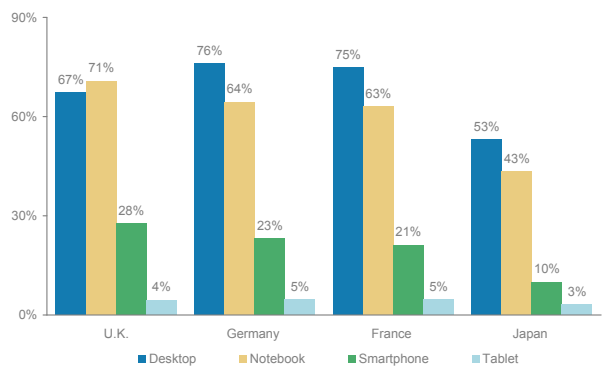


International Tablet Purchase Intentions Are Higher Than US Intentions

Tablet Purchase Intentions by Country

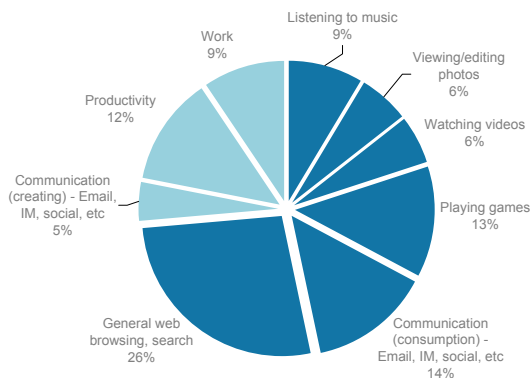


Computing Device Penetration by Country



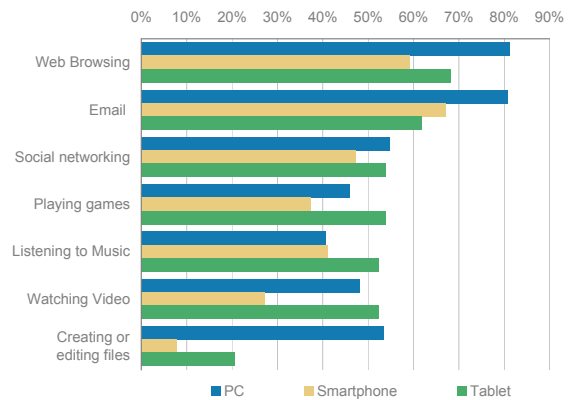
Majority of Time Spent on PCs is Consuming Content, Significant Usage Overlap

Consumer Personal Computer Usage, 2011



Content Consumption: 75%
Content Creation: 25%

% of Respondants Who Regularly Perform Activity by Device



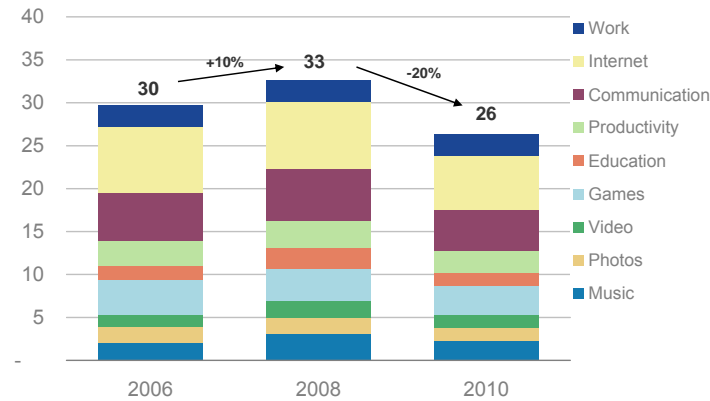
Source: AlphaWiseSM, Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

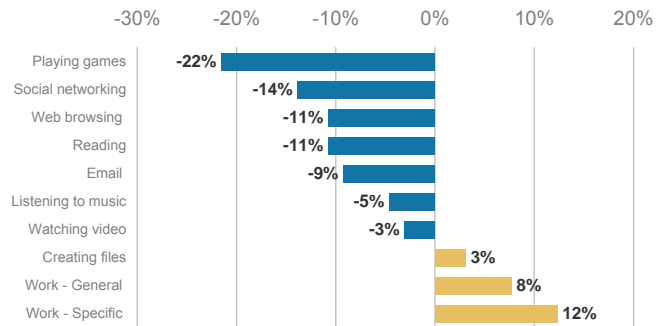
Appendix I: Key Survey Takeaways (continued)

Tablets Reduce PC Consumption Usage

Weekly Time Spent on Home PC, Hours

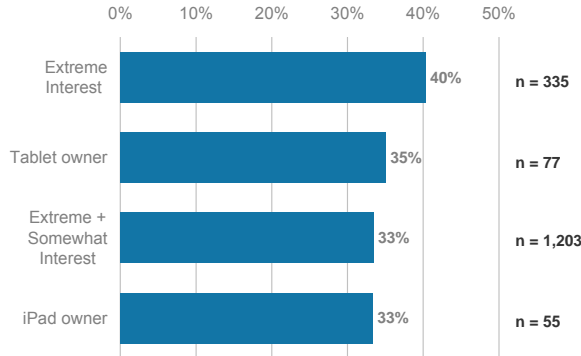


Net Increase (Decrease) in Time Spent on Existing Notebook/Netbook Following Tablet Purchase

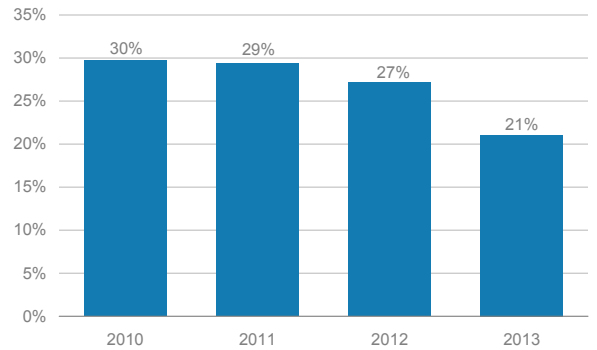


Tablets Defer PC Replacement Purchases and Cannibalize PC Sales

% of Tablet Purchases that Impact PC Purchase Plans

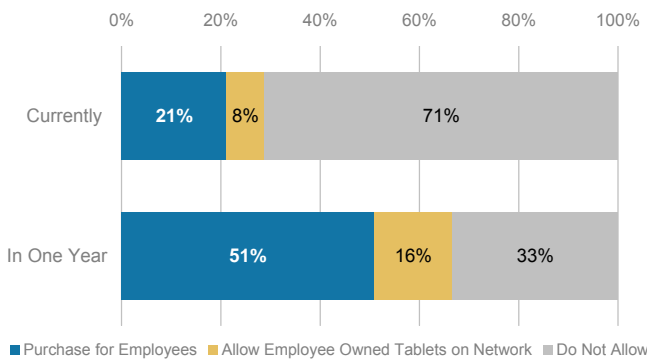


Tablet Cannibalization Estimate - Base Case

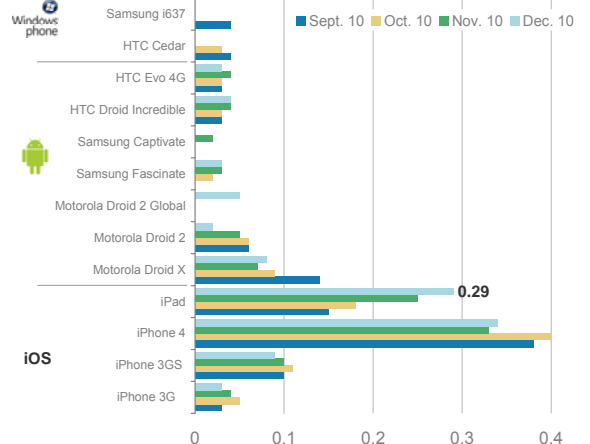


iPad Gaining Momentum in the Enterprise

Tablet Usage in the Enterprise



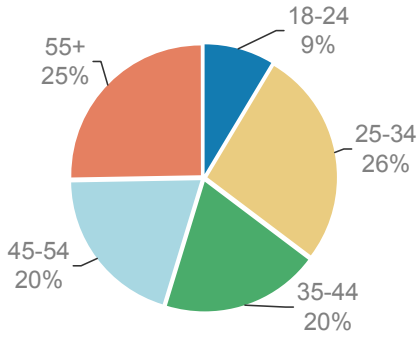
Good Technology Enterprise Device Activations by Platform



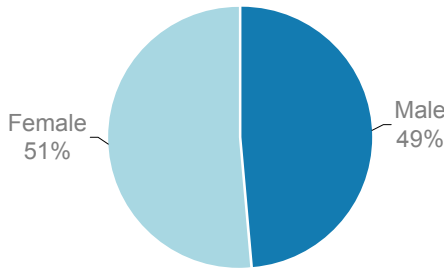
Source: AlphaWiseSM, Morgan Stanley Research

Appendix II: US Tablet Survey Demographics

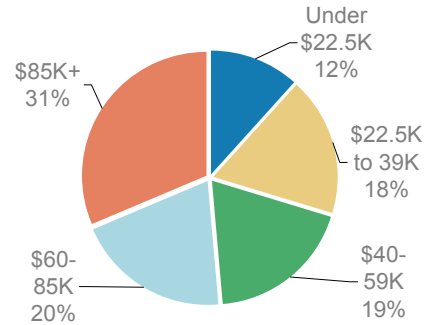
US Survey Respondents by Age



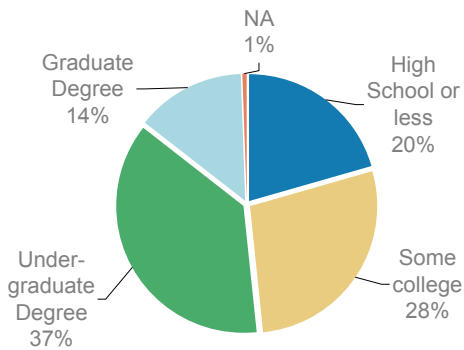
US Survey Respondents by Sex



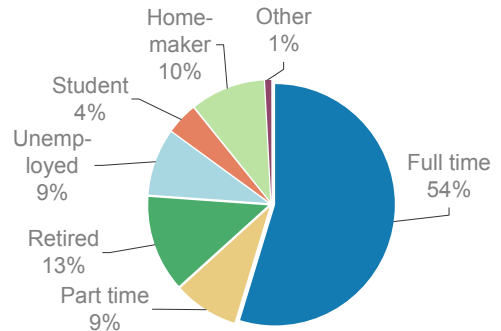
US Survey Respondents by Income



US Survey Respondents by Education



US Survey Respondents by Employment Status



Source: AlphaWiseSM, Morgan Stanley Research

February 14, 2011

Tablet Demand and Disruption

Appendix III: Models

Morgan Stanley Global Computing Model - Base Tablet Assumptions													
	1Q10	2Q10	3Q10	4Q10	1Q11e	2Q11e	3Q11e	4Q11e	2009	2010	2011e	2012e	2013e
Shipments (Millions)													
Desktops	35	36	37	38	36	36	38	42	136	146	152	157	159
Notebooks	40	37	42	45	43	43	49	53	135	164	189	210	232
Netbooks	8	10	10	9	8	7	7	7	34	36	29	26	27
Tablets	-	4	5	8	10	12	15	18	-	16	55	85	102
Total	83	86	93	100	97	98	109	120	305	362	425	478	519
PCs, gross	83	83	90	94	90	90	99	108	305	351	386	416	439
Tablet Cannibalization	-	(1)	(1)	(2)	(3)	(4)	(4)	(5)	-	(5)	(16)	(23)	(21)
PCs, net	83	82	89	92	87	86	95	102	305	346	370	393	417
Tablets	-	4	5	8	10	12	15	18	-	16	55	85	102
Total	83	86	93	100	97	98	109	120	305	362	425	478	519
YoY Growth													
Desktops	11%	11%	5%	2%	1%	0%	5%	12%	-10%	7%	5%	3%	1%
Notebooks	44%	29%	18%	6%	9%	16%	16%	18%	6%	22%	15%	11%	10%
Netbooks	26%	26%	-2%	-9%	-8%	-23%	-25%	-25%	118%	8%	-20%	-11%	5%
Tablets	-	-	-	-	-	250%	226%	125%	-	-	245%	54%	20%
Total	26%	25%	15%	11%	16%	15%	17%	21%	4%	19%	17%	12%	9%
PCs, gross	26%	22%	11%	5%	8%	8%	10%	14%	4%	15%	10%	8%	6%
Tablet Cannibalization	-	-	-	-	-	250%	222%	120%	-	-	242%	42%	-7%
PCs, net	26%	20%	10%	3%	4%	5%	7%	11%	4%	14%	7%	6%	6%
Tablets	-	-	-	-	-	250%	226%	125%	-	-	245%	54%	20%
Total	26%	25%	15%	11%	16%	15%	17%	21%	4%	19%	17%	12%	9%
Morgan Stanley Global Computing Model - Bull Tablet Assumptions													
	1Q10	2Q10	3Q10	4Q10	1Q11e	2Q11e	3Q11e	4Q11e	2009	2010	2011e	2012e	2013e
Shipments (Millions)													
Desktops	35	36	37	38	36	36	38	42	136	146	152	157	159
Notebooks	40	37	42	45	43	43	49	53	135	164	187	207	230
Netbooks	8	10	10	9	7	7	7	6	34	36	27	24	25
Tablets	-	4	5	8	12	15	17	21	-	16	65	101	120
Total	83	86	93	100	98	100	111	122	305	362	432	489	534
PCs, gross	83	83	90	94	90	90	99	108	305	351	386	416	439
Tablet Cannibalization	-	(1)	(1)	(2)	(4)	(4)	(5)	(6)	-	(5)	(19)	(27)	(25)
PCs, net	83	82	89	92	86	85	94	102	305	346	367	388	413
Tablets	-	4	5	8	12	15	17	21	-	16	65	101	120
Total	83	86	93	100	98	100	111	122	305	362	432	489	534
YoY Growth													
Desktops	11%	11%	5%	2%	1%	0%	5%	12%	-10%	7%	5%	3%	1%
Notebooks	44%	29%	18%	6%	8%	15%	15%	17%	6%	22%	14%	11%	11%
Netbooks	26%	26%	-2%	-9%	-12%	-26%	-29%	-29%	118%	8%	-24%	-14%	6%
Tablets	-	-	-	-	-	322%	283%	157%	-	-	306%	55%	19%
Total	26%	25%	15%	11%	18%	17%	19%	22%	4%	19%	19%	13%	9%
PCs, gross	26%	22%	11%	5%	8%	8%	10%	14%	4%	15%	10%	8%	6%
Tablet Cannibalization	-	-	-	-	-	322%	279%	151%	-	-	302%	43%	-7%
PCs, net	26%	20%	10%	3%	3%	4%	6%	11%	4%	14%	6%	6%	6%
Tablets	-	-	-	-	-	322%	283%	157%	-	-	306%	55%	19%
Total	26%	25%	15%	11%	18%	17%	19%	22%	4%	19%	19%	13%	9%
Morgan Stanley Global Computing Model - Bear Tablet Assumptions													
	1Q10	2Q10	3Q10	4Q10	1Q11e	2Q11e	3Q11e	4Q11e	2009	2010	2011e	2012e	2013e
Shipments (Millions)													
Desktops	35	36	37	38	36	36	38	42	136	146	152	157	159
Notebooks	40	37	42	45	43	43	49	54	135	164	190	212	234
Netbooks	8	10	10	9	8	8	8	7	34	36	30	28	29
Tablets	-	4	5	8	10	11	12	14	-	16	47	67	80
Total	83	86	93	100	97	97	107	118	305	362	419	465	502
PCs, gross	83	83	90	94	90	90	99	108	305	351	386	416	439
Tablet Cannibalization	-	(1)	(1)	(2)	(3)	(3)	(4)	(4)	-	(5)	(14)	(18)	(17)
PCs, net	83	82	89	92	87	87	95	104	305	346	372	398	422
Tablets	-	4	5	8	10	11	12	14	-	16	47	67	80
Total	83	86	93	100	97	97	107	118	305	362	419	465	502
YoY Growth													
Desktops	11%	11%	5%	2%	1%	0%	5%	12%	-10%	7%	5%	3%	1%
Notebooks	44%	29%	18%	6%	9%	17%	16%	20%	6%	22%	16%	12%	10%
Netbooks	26%	26%	-2%	-9%	-8%	-20%	-21%	-19%	118%	8%	-17%	-6%	4%
Tablets	-	-	-	-	-	201%	167%	77%	-	-	194%	42%	20%
Total	26%	25%	15%	11%	16%	13%	15%	18%	4%	19%	16%	11%	8%
PCs, gross	26%	22%	11%	5%	8%	8%	10%	14%	4%	15%	10%	8%	6%
Tablet Cannibalization	-	-	-	-	-	201%	164%	73%	-	-	191%	31%	-7%
PCs, net	26%	20%	10%	3%	4%	5%	8%	13%	4%	14%	8%	7%	6%
Tablets	-	-	-	-	-	201%	167%	77%	-	-	194%	42%	20%
Total	26%	25%	15%	11%	16%	13%	15%	18%	4%	19%	16%	11%	8%

Source: Company press releases, Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

Appendix III: Models (continued)

Morgan Stanley Global Tablet Model - Base Case													
	1Q10	2Q10	3Q10	4Q10	1Q11	2Q11	3Q11	4Q11	2010	2011	2012	2013	2014
Tablet Shipments (Millions)													
North America		3	3	4	4	5	6	7	9	22	29	34	37
Europe		1	1	2	4	4	5	6	4	20	28	32	35
Asia		0	1	2	2	3	3	4	3	12	25	33	38
Row		-	-	-	0	0	0	1	-	1	3	4	5
Total		4	5	8	10	12	15	18	16	55	85	102	114
YoY Growth													
North America	-	-	-	-	-	98%	107%	83%	-	142%	35%	14%	10%
Europe	-	-	-	-	-	476%	418%	170%	-	372%	43%	14%	10%
Asia	-	-	-	-	-	966%	344%	125%	-	334%	102%	31%	15%
Row	-	-	-	-	-	-	-	-	-	-	85%	41%	20%
Total	-	-	-	-	-	250%	226%	125%	-	245%	54%	20%	12%
Adult Internet Population Penetration Rate													
North America									4.0%	13.6%	25.3%	34.5%	42.3%
Europe									1.6%	8.9%	18.7%	27.1%	34.0%
Asia									0.6%	3.2%	8.1%	13.5%	18.9%
Row									0.0%	0.4%	1.0%	1.8%	2.6%
Total									1.2%	5.1%	10.8%	16.0%	20.7%

Source: Company press releases, Morgan Stanley Research

February 14, 2011

Tablet Demand and Disruption

Appendix IV: Summary of Tablet Offerings

Brand	Name	Launch	OS	Display	Processor	Entry-level Price (Unsubsidized)
Tier 1 Brands						
Acer	Tablet	Apr-11	Android 3.0	7"	Snapdragon, 1.2 GHz Dual Core	\$300-\$700
Acer	Iconia Tab	Feb-11	Windows 7	10"	AMD Fusion	\$550
Acer	Iconia Tab A500	Apr-11	Android 3.0	10"	Tegra 2 Dual Core, 1GHz	\$300-\$700
Apple	iPad	Apr-10	iOS	9.7"	Apple A4, 1GHz	\$500-830
Apple	iPad 2	Apr-11	iOS	9.7"	Apple	\$500-830
Asus	Eee Slate	Jan-11	Windows 7	12.1"	Intel Core i5 1.3GHz	\$1000-1100
Asus	Eee Pad Transformer	Apr-11	Android 3.0	10.1"	Tegra 2 Dual Core, 1GHz	\$399-699
Asus	Eee Pad Slider	May-11	Android 3.0	10.1"	Tegra 2 Dual Core, 1GHz	\$499-799
Asus	Eee Pad MeMO	Jun-11	Android 3.0	7"	Snapdragon, 1.2GHz Dual Core	\$499-699
Blackberry	PlayBook	Mar-11	Blackberry Tablet OS	7"	OMAP, 1GHz, Dual Core	\$500
Cisco	Cius	1H11	Android	7"	Intel Atom, 1.6GHz	NA
Dell	Streak 5	Aug-10	Android 1.6	5"	Snapdragon 8250, 1GHz	\$550
Dell	Streak 7	Feb-11	Android 2.2	7"	Tegra 2 Dual Core, 1GHz	\$450
Dell	Inspiron Duo	Nov-10	Windows 7	10"	Intel Atom Dual Core, N550, 1.5GHz	\$550
Dell	NA	2H11	Windows 7	10"	NA	NA
HP	Slate 500	Nov-10	Windows 7	8.9"	Atom, Z560, 1.86GHz	\$800
HP	TouchPad	Summer '11	WebOS	9.7"	Snapdragon 8660, 1.2 GHz Dual Core	NA
HTC	Tablet	1H11	Android 3.0	NA	Snapdragon	NA
Lenovo	LePad	1H11	Android 3.0	10.1"	Snapdragon	NA
LG	G-Slate	Mar-11	Android 3.0	8.9"	Tegra 2 Dual Core, 1GHz	NA
Motorola	Xoom	Feb-11	Android 3.0	10.1"	Tegra 2 Dual Core, 1GHz	\$800
Samsung	Galaxy Tab	Nov-10	Android 2.2	7"	Hummingbird, 1GHz	\$500
Samsung	Galaxy Tab 2	1H11	Android 3.0	7"	NA	NA
Samsung	PC 7	Mar-11	Windows 7	10.1"	Oak Trail 1.66GHz	\$699
Toshiba	Tablet	1H11	Android 3.0	10.1"	Tegra 2 Dual Core, 1GHz	NA
Selected Tier 2+ Brands						
Archos	70	Nov-10	Android 2.2	7"	OMAP, 1GHz	\$279 (8GB) or \$350
Archos	101	Nov-10	Android 2.2	10"	OMAP, 1GHz	\$300 (8GB) or \$350 (16GB)
Viewsonic	ViewPad 7	Nov-10	Android 2.2	7"	Snapdragon, 600 MHz	\$599
			Dual boot: Windows 7 /			
Viewsonic	ViewPad 10	Nov-10	Android 1.6	10"	Intel Atom N455, 1.66Ghz	\$599
Viewsonic	G Tablet	Nov-10	Android 2.2	10"	Tegra 2 Dual Core, 1GHz	\$399
Vizio	Via Tablet	1H11	Android 2.x	8"	1GHz processor	NA

Note: Some tablet specifications are estimated when official data is not available

Source: Company press releases, company websites, Morgan Stanley Research

February 14, 2011
Tablet Demand and Disruption

Morgan Stanley Blue Papers

Morgan Stanley Blue Papers address long-term, structural business changes that are reshaping the fundamentals of entire economies and industries around the globe. Analysts, economists, and strategists in our global research network collaborate in the Blue Papers to address critical themes that require a coordinated perspective across regions, sectors, or asset classes.

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February 14, 2011

Tablet Demand and Disruption

Morgan Stanley is acting as financial advisor to Compellent Technologies, Inc. ("Compellent") with respect to their proposed acquisition by Dell Inc., as announced on December 13, 2010.

The proposed transaction is subject to the approval of Compellent shareholders and other customary closing conditions. This report and the information provided herein is not intended to (i) provide voting advice, (ii) serve as an endorsement of the proposed transaction, or (iii) result in the procurement, withholding or revocation of a proxy or any other action by a security holder.

Compellent has agreed to pay fees to Morgan Stanley for its financial advisory services, including transaction fees that are contingent upon the consummation of the proposed transaction.

Please refer to the notes at the end of the report.

Morgan Stanley is acting as financial advisor to McAfee, Inc. ("McAfee") with respect to the announced proposed acquisition of the company by Intel Corporation, as announced on August 19, 2010.

The proposed transaction is subject to the approval of McAfee shareholders, regulatory approvals, and other customary closing conditions. This report and the information provided herein is not intended to (i) provide voting advice, (ii) serve as an endorsement of the proposed transaction, or (iii) result in the procurement, withholding or revocation of a proxy or any other action by a security holder.

McAfee has agreed to pay fees to Morgan Stanley for its financial advisory services, including transaction fees that are contingent upon the consummation of the proposed transaction.

Please refer to the notes at the end of the report.

Morgan Stanley & Co. Limited and Morgan Stanley & Co. International plc are acting as financial adviser and joint corporate broker, respectively, to British Sky Broadcasting Group plc ("BSkyB") on the proposal from News Corporation relating to a possible offer for the entire issued share capital of BSkyB not already owned by News Corporation.

In accordance with its general policy, Morgan Stanley currently expresses no rating, price target or estimates on BSkyB and no rating or price target on News Corporation. This report and the information herein are not intended to serve as an endorsement of the proposed transaction.

This report was prepared solely upon information generally available to the public. No representation is made that it is accurate and complete. This report is not a recommendation or an offer to buy or sell the securities mentioned. Please refer to the notes at the end of this report.

February 14, 2011
Tablet Demand and Disruption

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February 14, 2011

Tablet Demand and Disruption

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(as of January 31, 2011)

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Stock Rating Category	Coverage Universe		Investment Banking Clients (IBC)		
	Count	% of Total	Count	% of Total IBC	% of Rating Category
Overweight/Buy	1184	41%	449	44%	38%
Equal-weight/Hold	1210	42%	439	43%	36%
Not-Rated/Hold	122	4%	25	2%	20%
Underweight/Sell	390	13%	115	11%	29%
Total	2,906		1028		

Data include common stock and ADRs currently assigned ratings. An investor's decision to buy or sell a stock should depend on individual circumstances (such as the investor's existing holdings) and other considerations. Investment Banking Clients are companies from whom Morgan Stanley received investment banking compensation in the last 12 months.

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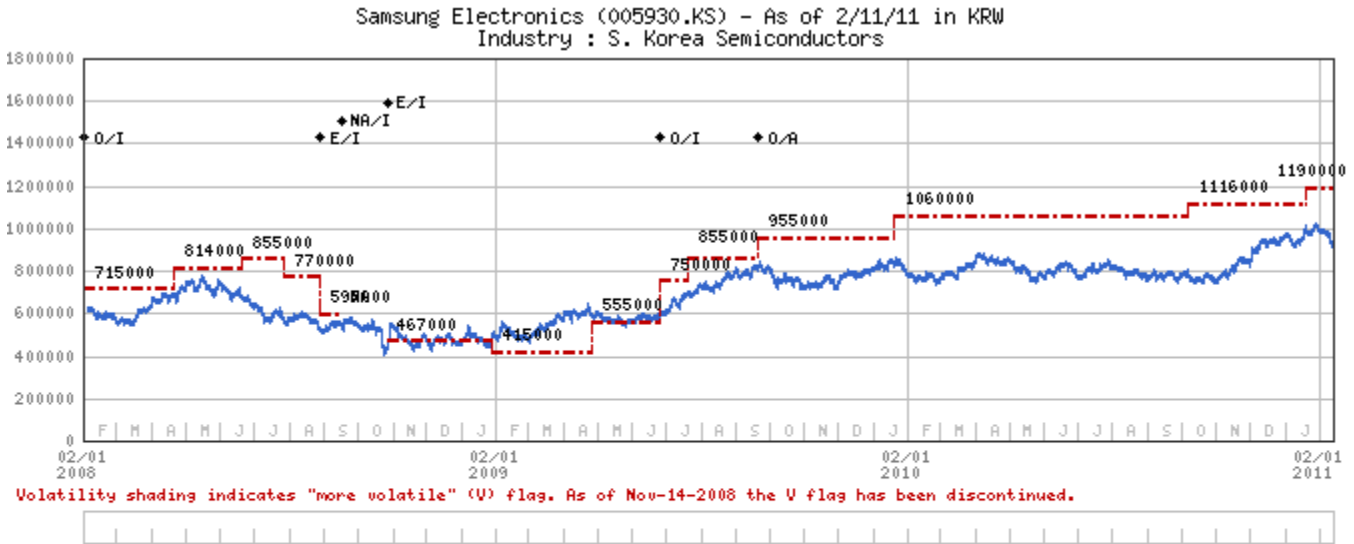
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February 14, 2011
Tablet Demand and Disruption

Cautious (C): The analyst views the performance of his or her industry coverage universe over the next 12-18 months with caution vs. the relevant broad market benchmark, as indicated below.

Benchmarks for each region are as follows: North America - S&P 500; Latin America - relevant MSCI country index or MSCI Latin America Index; Europe - MSCI Europe; Japan - TOPIX; Asia - relevant MSCI country index.

Stock Price, Price Target and Rating History (See Rating Definitions)



Stock Rating History: 2/1/08 : O/I; 8/28/08 : E/I; 9/16/08 : NA/I; 10/27/08 : E/I; 6/26/09 : O/I; 9/21/09 : O/A
 Price Target History: 7/6/07 : 715000; 4/21/08 : 814000; 6/20/08 : 855000; 7/28/08 : 770000; 8/28/08 : 597000;
 9/16/08 : NA; 10/27/08 : 467000; 1/28/09 : 415000; 4/27/09 : 555000; 6/26/09 : 750000; 7/21/09 : 855000;
 9/21/09 : 955000; 1/19/10 : 1060000; 10/7/10 : 1116000; 1/20/11 : 1190000

Source: Morgan Stanley Research Date Format : MM/DD/YY Price Target -- No Price Target Assigned (NA)
 Stock Price (Not Covered by Current Analyst) — Stock Price (Covered by Current Analyst) ■
 Stock and Industry Ratings (abbreviations below) appear as ♦ Stock Ratings/Industry View
 Stock Ratings: Overweight (O) Equal-weight (E) Underweight (U) Not-Rated (NR) More Volatile (U) No Rating Available (NA)
 Industry View: Attractive (A) In-line (I) Cautious (C) No Rating (NR)

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February 14, 2011

Tablet Demand and Disruption

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February 14, 2011

Tablet Demand and Disruption

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2353.TW	Acer Inc.	TWD 73.10	NWSa.O	News Corporation	USD 16.76
AMD.N	Advanced Micro Devices	USD 8.22	6594.OS	Nidec	JPY 7790
AAPL.O	Apple, Inc.	USD 354.54	7974.OS	Nintendo	JPY 24040
ARM.L	ARM Holdings Plc	GBp 595	NVDA.O	NVIDIA Corporation	USD 22.82
2357.TW	Asustek Computer Inc.	TWD 247	QCOM.O	Qualcomm Inc.	USD 57
BRCM.O	Broadcom Corporation	USD 43.72	RIMM.O	Research In Motion Ltd.	USD 66.88
CBS.N	CBS Corporation	USD 21.62	7752.T	Ricoh	JPY 1093
3481.TW	Chimei Innolux	TWD 33.90	CRM.N	Salesforce.com	USD 137.96
CTXS.O	Citrix Systems Inc	USD 68.63	005930.KS	Samsung Electronics	KRW 936000
DELL.O	DELL	USD 13.85	SNDK.O	SanDisk	USD 50.81
HPQ.N	Hewlett-Packard	USD 48.54	STX.O	Seagate Technology	USD 14.39
2317.TW	Hon Hai Precision	TWD 119	6758.T	Sony	JPY 2882
2498.TW	HTC Corporation	TWD 949	SFSF.O	SuccessFactors	USD 35.02
INTC.O	Intel Corporation	USD 21.80	6762.T	TDK	JPY 5700
INTU.O	Intuit	USD 50.54	TXN.N	Texas Instruments	USD 35.19
0992.HK	Lenovo	HKD 4.44	6502.T	Toshiba	JPY 509
LXK.N	Lexmark International	USD 40.35	VMW.N	VMware Inc	USD 89.80
MRVL.O	Marvell Technology Group Ltd	USD 19.66	DIS.N	Walt Disney Co	USD 43.31
MMI.N	Motorola Mobility Holdings, Inc	USD 31.19	WDC.N	Western Digital	USD 35.16
NFLX.O	Netflix Inc	USD 223.20	3622.TW	Young Fast Optoelectronics	TWD 272