

Industry Surveys

Technology Hardware, Storage & Peripherals

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Equity Analyst

Performance

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EXECUTIVE SUMMARY

◆ CFRA notes that revenue for the technology hardware, storage & peripherals industry is expected to increase nearly 9% in 2017, following our projection of a relatively flat 2016. We note that 2016 marked the first time Apple Inc. ever witnessed a year-over-year decline for its iPhone, while Samsung Electronics Co. Ltd experienced the worst product recall on record for the industry, with the demise of the Note 7 in late 2016. Given this situation, we see 2017 as crucial for both companies, but our outlook for the year ahead looks promising.

◆ CFRA expects growth in the smartphone space to re-accelerate in 2017 after a lackluster 2016 (0%–1% growth). We note that 2016 will go down as the slowest growth rate thus far for the industry, but we see improving prospects for 2017, with an anticipated 5% increase in shipments. Smartphone penetration rates relative to total mobile phones will likely reach 75% in 2017, largely due to Apple and Samsung's anticipated release of next-generation products.

◆ The next-generation iPhone to be released in the fall of 2017 will witness shipments that surpass all previous iPhone launches, according to CFRA's calculations. While the iPhone 6 currently holds that title, we note a much larger installed base and we expect the next iPhone to have a number of new aesthetic features, which will mark iPhone's 10-year anniversary. We foresee a massive upgrade cycle or mega cycle as new features will likely include a bezel-free organic light-emitting diode (OLED) screen (which is lightweight and flexible, and has better picture quality and power efficiency), wireless charging, and the removal of the home button (which increases display real estate).

◆ For the PC space, CFRA forecasts a more modest 2%–3% decline in 2017 compared with our estimated mid- to high-single-digit drop in 2016. We note that sales have fallen more than 25% since peaking in 2011, and we expect growth to remain elusive. An aging PC infrastructure and the potential for Windows 10 to begin witnessing adoption on the enterprise side in 2017 could help to provide support for the space. That said, we think the PC market remains in a long-term secular decline, with no signs of a major recovery.

◆ Shipments of wearable devices will likely increase 25%–35% in 2017, according to CFRA, near the estimated 29% level for 2016. While adoption rates have increased, which will result in decelerating growth in the coming years, we expect strong growth this year, driven by the emergence of untethered devices into the market. The Apple Watch Series 3, expected to be released in the fall of 2017, is touted to be a major update, with an anticipated front-facing FaceTime camera that will appeal to consumers, among other features.

◆ While pricing pressure is likely to remain across the industry, constraining gross margin expansion, CFRA anticipates operating margin expansion over time as manufacturers benefit from higher volume and tight cost controls. Competition will likely be greatest at the low end of the smartphone, PC, and tablet chain, while the high end should be less exposed to price sensitivity, as these consumers are more likely to spend on next-generation and better-performing devices.

◆ Companies in the technology hardware, storage & peripherals industry seem more inclined to increase debt levels given their strong balance sheets and favorable interest-rate environment, based on CFRA's leverage analysis. In addition, robust cash positions and healthy free flow generation will likely result in greater shareholder return via share repurchases and dividend increases.

◆ Multiples for the technology hardware, storage & peripherals industry expanded in the second half of 2016 and CFRA sees further margin expansion potential in the coming quarters, as we envision smartphone growth accelerating and PC pressures moderating. We see upside potential to S&P Capital IQ consensus estimates in 2017 and 2018, partly due to an expected improvement in product replacement cycles for next-generation devices.

◆ CFRA thinks 2017 is shaping up to be an exciting year for the technology hardware, storage & peripherals industry, given anticipated next-generation devices from the largest manufacturers in the world. That said, smartphone growth should accelerate and we expect PC trends to stabilize, setting up a more favorable landscape for the year ahead.

SECTOR OVERVIEW

Year to date through January 20, the S&P 500 information technology index, which represented 21.2% of the S&P 500 index, was up 3.5% in price, compared with a 1.5% increase for the S&P 500. In 2016, this sector index rose 12.0%, versus a price advance of 9.5% for the S&P 500. There are 13 sub-industry indices in the information technology sector. Internet software & services is the largest, representing 21.0% of the sector's market value, while electronic equipment & instruments is the smallest, accounting for 0.11% of the sector.

The information technology sector is projected to record an 11.8% year-over-year increase in operating earnings per share (EPS) in 2017 compared with the estimated EPS gain of 11.7% for the S&P 500, according to S&P Capital IQ consensus estimates. For 2016, this sector is estimated to have posted a 3.9% rise in EPS, versus a flat reading for the S&P 500. In addition, revenues for the sector are forecast to increase 10.3% in 2017 versus the projected gain of 6.4% for the S&P 500. The sector's price-to-earnings ratio (P/E) of 16.8x, based on consensus operating EPS estimates for 2017, is below the 17.4x forward P/E ratio for the S&P 500.

The consensus long-term EPS growth estimate for the information technology sector is 12.9% versus the 10.7% for the S&P 500, giving the sector a P/E-to-projected EPS growth rate (PEG) ratio of 1.3x, which is below the broader market's PEG of 1.6x. Finally, this sector pays a dividend yield of 1.4% compared with the 2.0% yield for the S&P 500.

INFORMATION TECHNOLOGY SECTOR AND INDEX PRICE PERFORMANCE

(as of January 31, 2017)

INDUSTRIES	INDEX VALUE	% OF S&P 1500	PRICE CHANGES (in percent)				
			2017 JANUARY	3-MONTHS	YEAR-TO-DATE	2016	5-YEAR CAGR
Information Technology	872.46	20.83	4.15	5.96	4.15	13.01	13.86
Application Software	757.15	1.10	7.87	6.16	7.87	7.83	18.16
Communications Equipment	169.82	1.07	0.52	3.39	0.52	16.33	5.82
Data Processing & Outsourced Services	1,012.94	2.27	2.83	2.71	2.83	6.69	20.61
Electronic Components	146.85	0.27	5.27	12.11	5.27	34.14	15.81
Electronic Equipment & Instruments	401.77	0.17	2.28	19.82	2.28	33.35	11.09
Electronic Manufacturing Services	222.38	0.25	5.19	17.30	5.19	19.18	13.60
Home Entertainment Software	377.97	0.26	8.71	0.45	8.71	5.50	34.06
Internet Software & Services	17,943.24	4.06	7.17	1.40	7.17	5.20	24.45
IT Consulting & Other Services	462.13	1.35	1.00	8.44	1.00	15.50	2.92
Semiconductor Equipment	532.73	0.42	6.77	18.94	6.77	42.44	17.27
Semiconductors	683.54	2.88	1.00	8.33	1.00	25.87	13.76
Systems Software	1,340.44	3.07	4.30	6.84	4.30	10.55	14.08
Technology Distributors	378.04	0.11	0.06	14.89	0.06	27.35	11.52
Technology Hardware, Storage & Peripherals	146.66	3.53	4.87	7.69	4.87	13.65	NA
S&P 500	2,278.87	89.25	1.79	7.18	1.79	9.54	11.67
S&P MidCap 400	1,687.19	7.48	1.60	11.77	1.60	18.73	12.49
S&P SmallCap 600	834.20	3.28	(0.45)	15.45	(0.45)	24.75	13.54
S&P Composite 1500	529.90	100.00	1.70	7.77	1.70	10.65	11.79

Source: S&P Dow Jones Indices.

ETF Market Flows and Investing Landscape

◆ Beside stocks, exchange-traded funds (ETFs) are increasingly used by investors. ETFs offer investors benefits such as market focus, intraday market liquidity, and lower fees relative to other diversified financial instruments. Investors interested in exploring opportunities aligned with either

the broad information technology sector, or more specifically, the technology hardware, storage & peripherals industry, may want to consider one or more of the ETFs discussed in this *Survey*.

◆ In 2016, a number of sectors experienced outflows, including information technology, which shed about \$700 million of assets, even as materials and real estate investment trusts (REITs) gathered net inflows. In the first month of 2017, information technology sector ETFs had \$932 million of inflows.

◆ There are no dedicated technology hardware, storage & peripherals ETFs. However, the industry is the largest in many diversified technology-oriented ETFs. The three largest, market cap-weighted products—PowerShares QQQ Trust (QQQ), Technology Select Sector SPDR (XLK), and Vanguard Information Technology (VGT)—all have 16% or more of assets in Apple and its peers.

SECTOR ETF INFLOWS		
<i>(total inflows for the period ended, in \$, millions)</i>		
SECTOR	YEAR ENDED 2016	FIRST MONTH, 2017
Consumer Discretionary	(5,272)	364
Consumer Staples	(2,354)	(287)
Energy	6,343	874
Financials	4,992	852
Health Care	(3,241)	(322)
Industrials	6,919	622
Information Technology	(697)	932
Materials	12,620	1,234
REITs	7,502	1,587
Telecommunication Services	267	240
Utilities	2,040	(930)

Source: State Street Global Advisors.

◆ In 2016, XLK was unpopular with investors and shed assets, while VGT pulled in nearly \$1 billion in assets.

◆ Meanwhile, Fidelity MSCI Information Technology (FTEC), which launched in October 2013, grew to more than \$600 million in 2016.

ETFs WITH MEANINGFUL TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS EXPOSURE			
COMPANY TICKER	ETF NAME	ASSETS UNDER MANAGEMENT <i>(in \$, millions)</i>	NET EXPENSE RATIO
QQQ	PowerShares QQQ Trust	43,005	0.20
XLK	Technology Select Sector SPDR	14,775	0.14
VGT	Vanguard Information Technology	10,700	0.10
IYW	iShares US Technology	3,062	0.44
FTEC	Fidelity MSCI Information Technology	603	0.08
MTK	SPDR Morgan Stanley Technology	585	0.35

Source: CFRA ETF Report January 12, 2017.

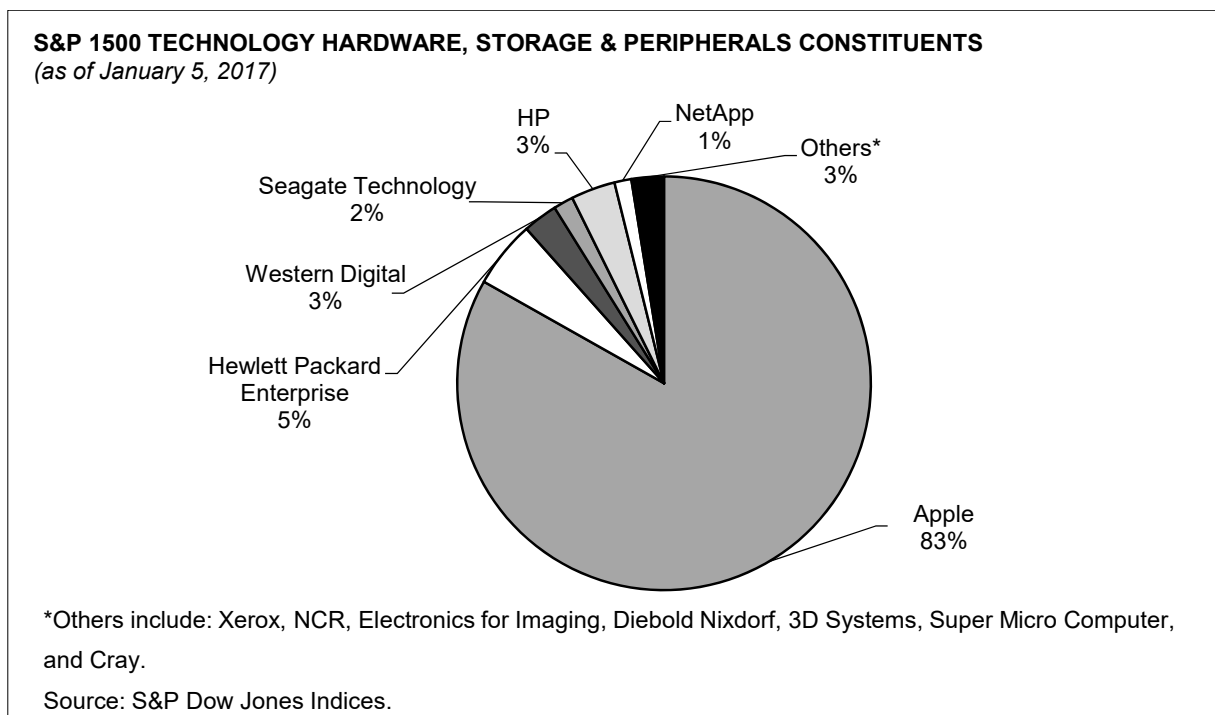
INDUSTRY OVERVIEW

The technology hardware, storage & peripherals industry is benefiting from secular trends within the mobility space, specifically greater adoption of smartphone devices as well as the emergence of wearable devices, which CFRA expects to persist in the coming years. The PC market remains in the midst of a secular decline, following pronounced declines from 2011 to 2016. The tablet arena has matured, and replacement cycles are likely to remain high. Apple, which comprises more than 80% of the industry group, is the key constituent to watch.

Industry Revenues

◆ CFRA expects industry revenues to increase nearly 9% in 2017 following our projection of a relatively flat 2016. We note that 2016 marked the first time Apple ever witnessed a year-over-year decline for its iPhone, while Samsung experienced the worst product recall on record for the industry, with the demise of the Note 7 in late 2016. Given this situation, we see 2017 as crucial for both companies, but our outlook for the year ahead looks promising.

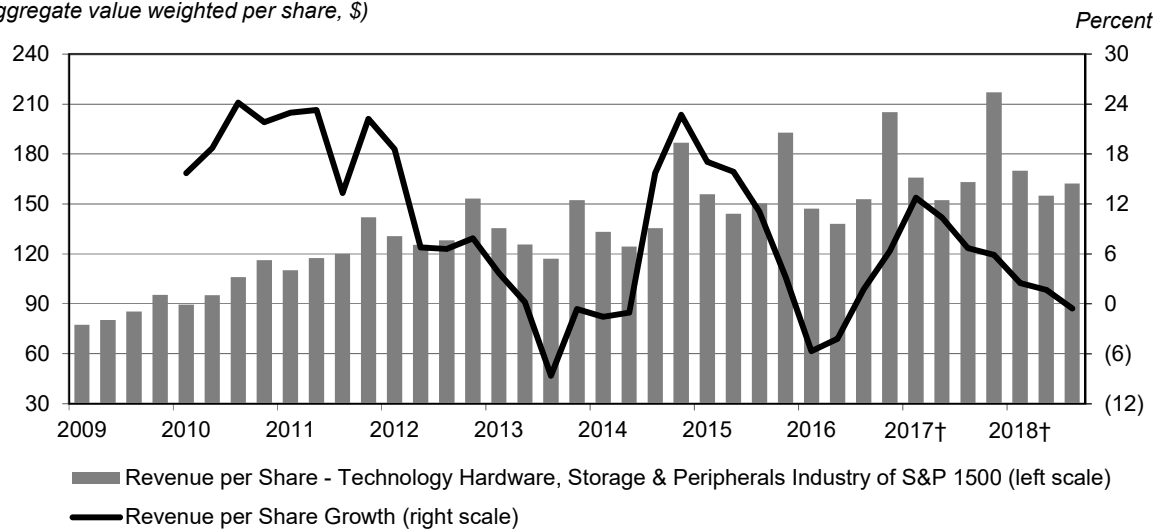
◆ Revenue for the industry increased 12% in 2015, after rising 9% in the prior year, as the smartphone segment benefited from the consumer shift to larger screen devices. Specifically, Apple's launch of the iPhone 6 in the fall of 2014 marked the company's initial move to larger screens and its highest revenue-generating device thus far.



◆ In terms of revenue and shipments, the mobile phone market is by far the most important category in the technology hardware, storage & peripheral supply chain. As far as operating systems are concerned, Google's Android and Apple's iOS platforms currently account for more than 95% of the total market share, and CFRA sees little that can change the dominance of these two companies in the category over the next several years.

REVENUE AND REVENUE GROWTH*

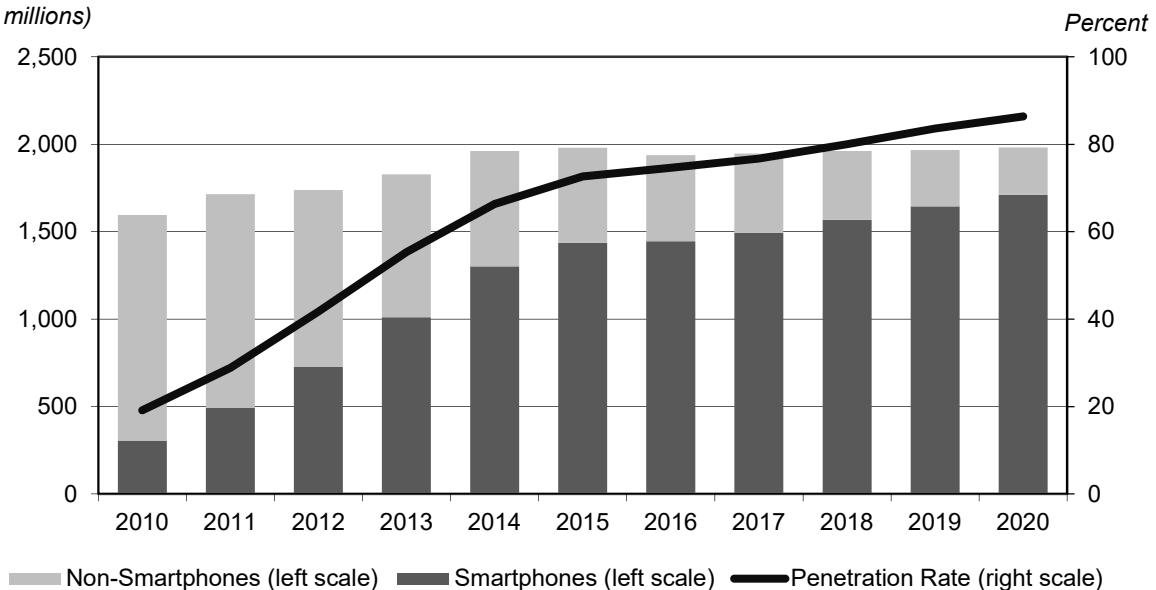
(aggregate value weighted per share, \$)



*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index. †Projected values start from first quarter of 2017.
 Source: S&P Capital IQ.

WORLDWIDE MOBILE PHONE SHIPMENTS

(in millions)



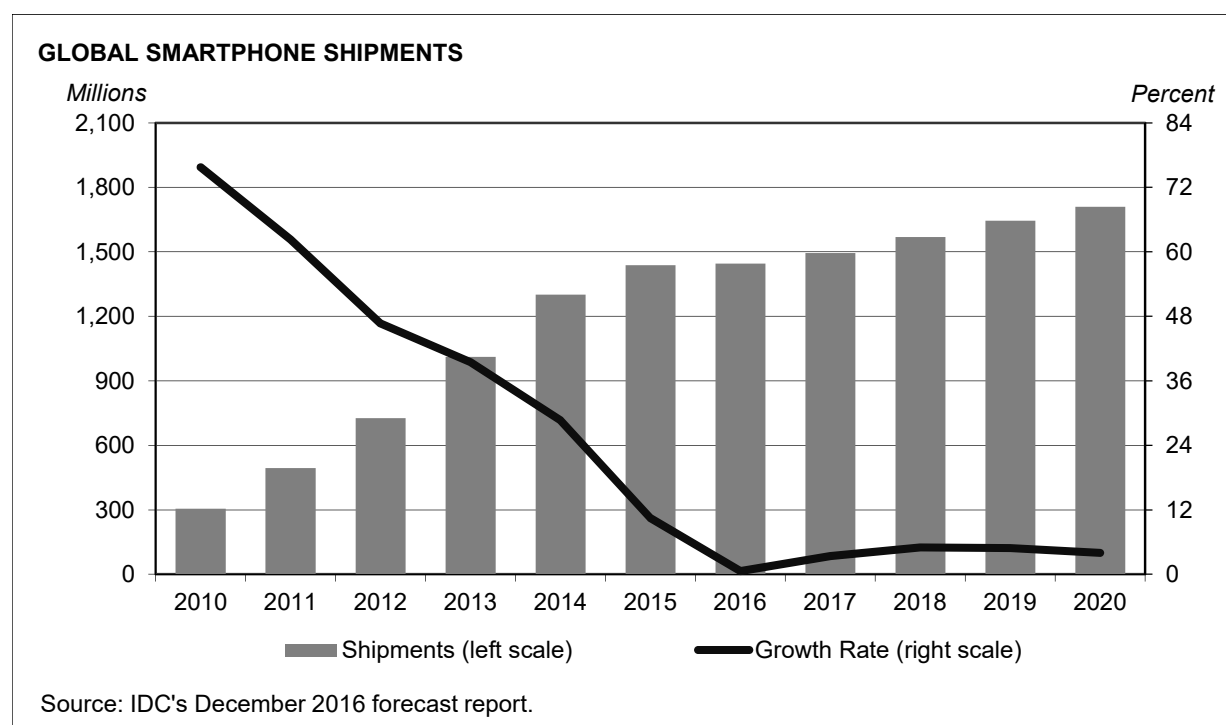
Source: IDC's December 2016 forecast report.

◆ Over the last decade, the industry has benefited from the global adoption of smartphones, which provide significantly more content than traditional non-smartphones. Smartphone penetration reached 75% of total mobile phones in 2016, compared with 55% in 2013 and less than 20% in 2010.

◆ Smartphones will likely comprise about 80% of total mobile phone shipments in 2018 and almost 90% by 2020, with Asia and emerging markets being the biggest contributors given the maturation of smartphones in the US and European regions.

◆ Global smartphone shipments are estimated to have remained relatively flat in 2016, increasing less than 1.0% to reach one billion for the year. Smartphone growth has decelerated in recent years, with increases of 10.5% in 2015 and 28.6% in 2014. While CFRA projects that growth will accelerate 3.4% in 2017, the days of percentage increases of more than 10% seem unlikely in the foreseeable future.

◆ The lower smartphone growth rates reflect a much more mature and penetrated industry, as well as less innovation on the horizon, in CFRA's view. We see the eventual shift to 5G technology as a potential opportunity in the coming years.



◆ Samsung and Apple remain the clear market share leaders on the hardware side. While Apple has grown its installed base significantly since it entered the large-screen smartphone category, the company witnessed a lackluster replacement cycle following the launch of the iPhone 6s. Given market share data figures, consumers have been migrating to larger screen devices over the last several years. CFRA thinks the iPhone 7 release anticipated in the fall of 2017 will fare better than the iPhone 6s cycle, and we note more favorable comparables ahead.

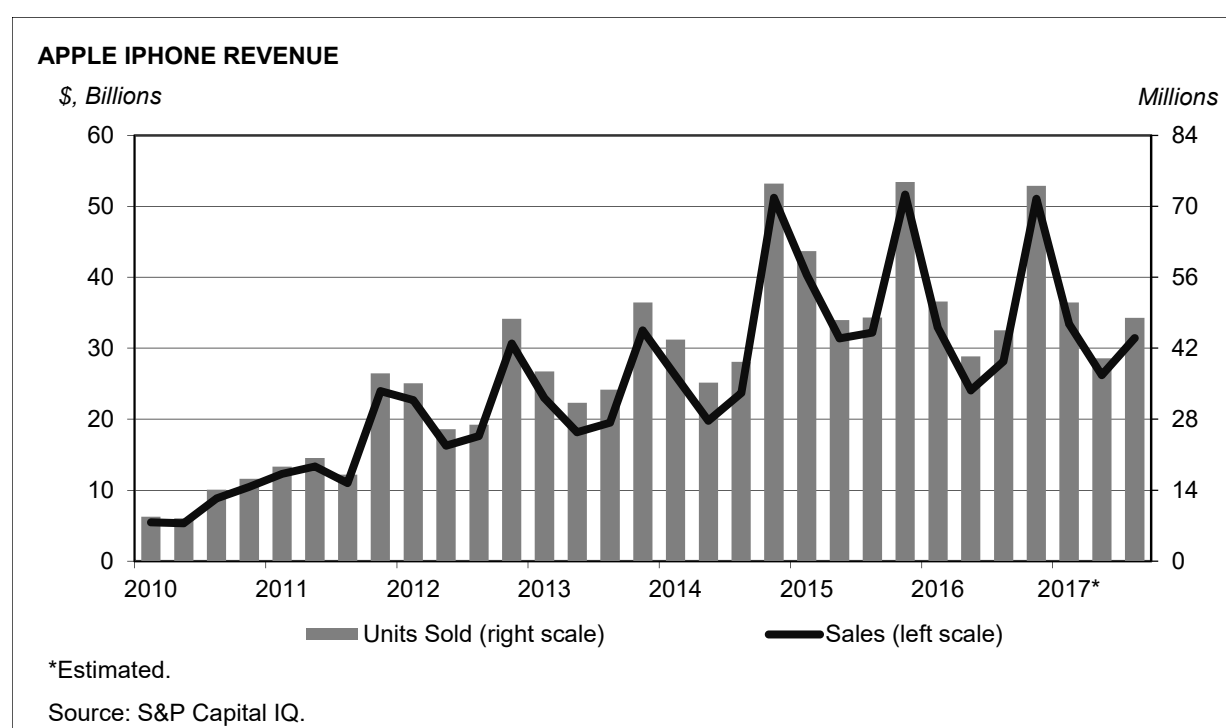
◆ The next-generation iPhone to be released in the fall of 2017 will witness shipments that surpass all previous iPhone launches, according to CFRA's calculations. While the iPhone 6 currently holds that title, we note a much larger installed base and we expect the next iPhone to have a number of new aesthetic features, which will mark iPhone's 10-year anniversary. We see a massive upgrade cycle or mega cycle as new features will likely include a bezel-free organic light-emitting diode (OLED) screen (which is lightweight and flexible, and has better picture quality and power efficiency), wireless charging, and the removal of the home button (which increases display real estate).

◆ CFRA notes that Chinese competitors such as Huawei are taking market share at the low end of the market. The greater availability of lower-priced devices will likely continue to drive smartphone penetration in Asia and other emerging regions for years to come. We expect Asia to

represent more than half of all smartphone shipments in 2017 and 2018, making it the most important geographic region for smartphones.

◆ Apple's iPhone is by far the single most important product offering for the technology hardware, storage & peripherals industry in terms of revenue and earnings potential. Not only is the iPhone's success important for Apple, it has a trickle-down effect on the entire technology space. CFRA expects next-generation devices in the second half of 2017 to support higher demand for the entire supply chain.

◆ Samsung will likely make a successful comeback with the Galaxy S8 after the Note 7 flop. Although Samsung saw its market share within the overall smartphone space decline to a low of 20% in the third quarter of 2016 from a peak of 33% in the first quarter of 2013, the company remains the industry leader. Samsung is expected to delay the launch of the Samsung Galaxy S8 to mid-April. The company will use the extra time to regain consumer confidence and ensure that it does not repeat the Note 7 issues.



◆ In the fourth quarter of fiscal 2016 (the three months ended September 2016), iPhone sales accounted for 60% of Apple's revenue, compared with 63% in the prior-year period. CFRA notes that China remains the most important growth region for Apple, but recent maturation in that market is pushing the company to look for growth in other emerging markets such as India.

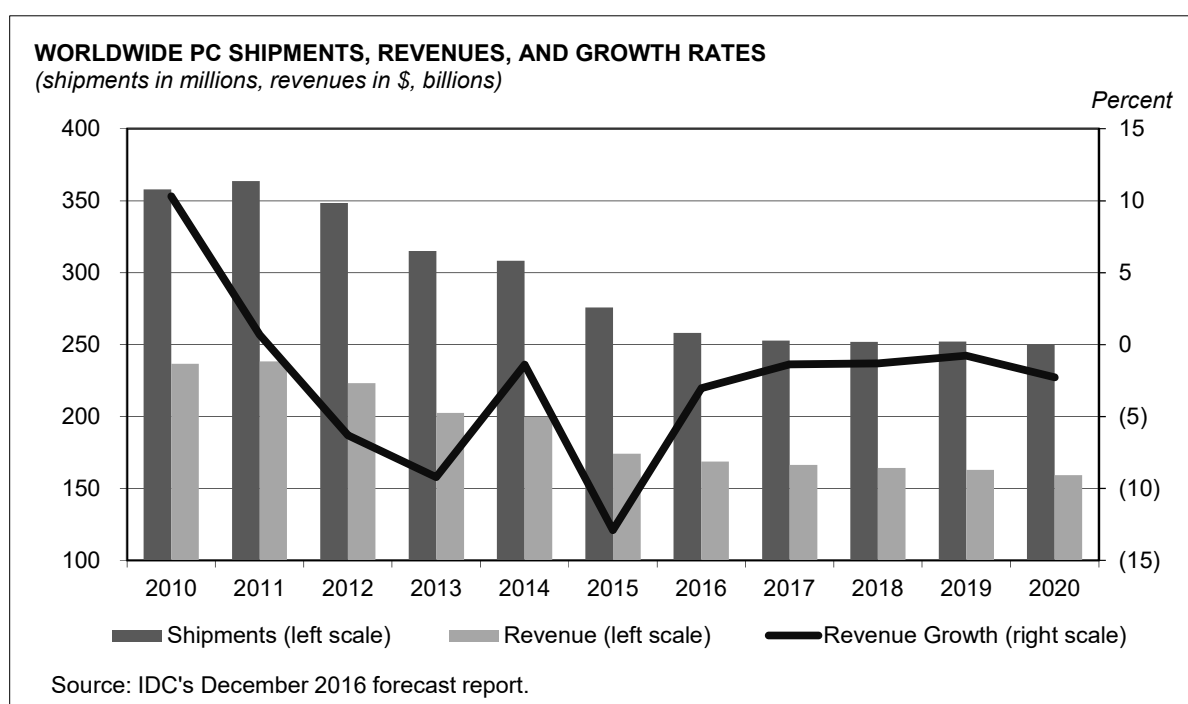
◆ While the selling price of smartphones has come down, Apple has been able to sustain its prices. However, the company is beginning to place greater focus on the mid-tier market after releasing its lower-priced (starts at \$399) smaller-screen iPhone SE device in March 2016. These devices should help Apple be more aggressive in emerging markets, and will likely help the company grow its installed base further. In the September 2016 quarter, the selling price of smartphones was down 8% year over year, based on CFRA analysis, despite a sequential increase of almost 4%.

◆ The PC market has witnessed a steep correction since the second half of 2011. The declines are expected to moderate in 2017, and CFRA thinks this will be the best year for the PC market since 2014, when it benefited from the expiration of Windows XP support on the enterprise side. Windows 10 enterprise adoption will likely stabilize PC sales from the 2%–3% decline forecast for 2017 through 2019, and a projected PC shipment decline of nearly 31% from the market peak in 2011.

◆ Overall, the cooling of the tablet market, new innovative product offerings on the horizon, and an aging PC landscape will likely all support some corporate spending for PCs.

◆ Over time, CFRA expects all of Microsoft Corp.’s customers on the enterprise side to transition to Windows 10, as the company has stated it is its last operating system launch. Going forward, Microsoft plans to operate “Windows as a Service” that will automatically perform upgrades on a periodic basis.

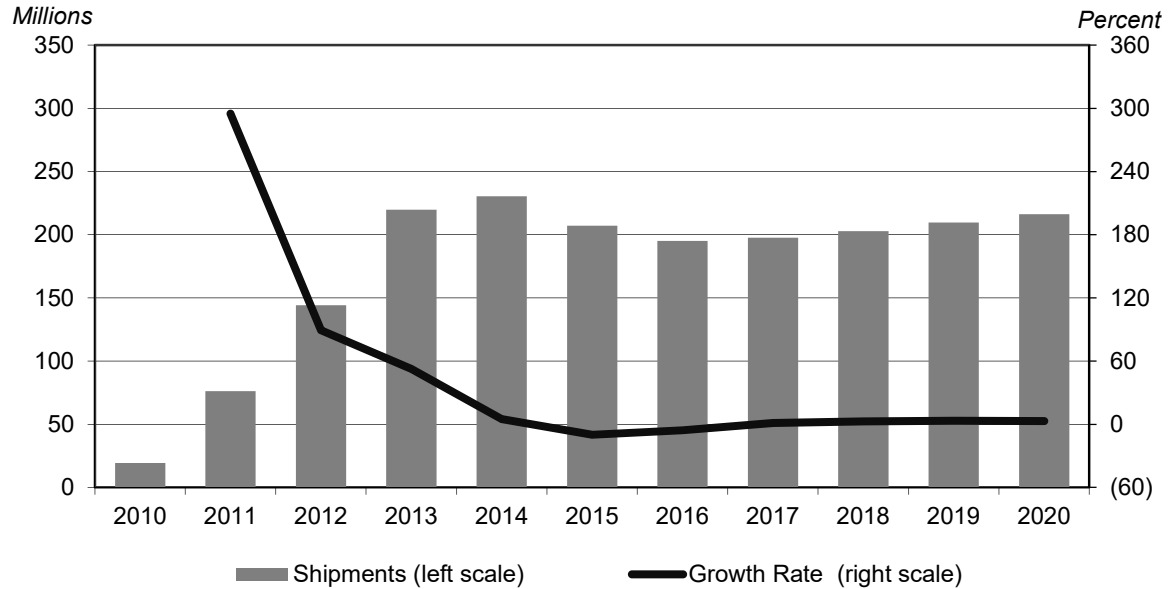
◆ CFRA expects Windows 10 Enterprise adoption to increase and to help ease PC declines from 2017 to 2019. The most important reason for this is that support for Windows 7 will expire in January 2020. In addition, Windows 10 is highly compatible with Windows 7 applications and devices, and demand for 2-in-1 devices is expected to increase.



◆ The tablet market still represents a relatively new category, as it emerged in 2010 after the launch of the iPad. This market saw unprecedented growth before shipments peaked in 2014.

◆ The shift in consumer preference toward larger screen “phablet” devices and the longer-than-expected replacement cycle is having an adverse effect on tablet sales, in CFRA’s view. A “base” case scenario for tablets is now one where shipments are likely to rise at an annualized pace of between 1% and 3% over the next three years. However, we note that tablets witnessed their first full-year shipment decline in 2015 (down 10%), and IDC estimates that demand for tablets fell again in 2016.

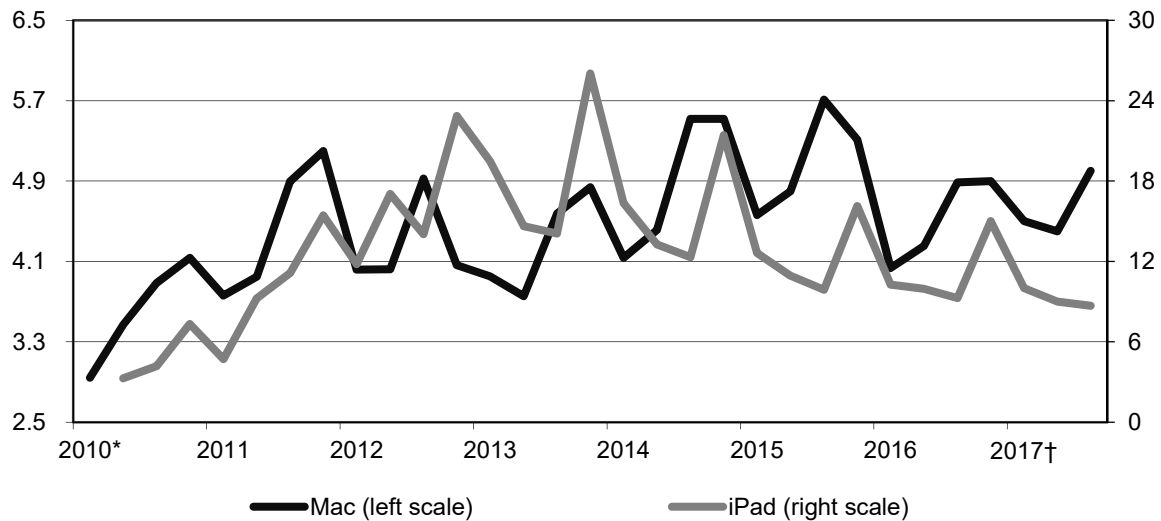
TABLET SHIPMENTS



Sources: IDC and S&P Capital IQ.

◆ Apple has been the clear leader with its iPad Air and mini devices, but sales for the company in this category have also been challenged. While new product refreshes are likely for Apple, CFRA does not think this will be enough to accelerate growth in the tablet arena. We note that iPad sales witnessed double-digit declines in both 2014 and 2015. Apple began shipments of its larger screen tablet device (iPad Pro) in November 2015 and smaller version of the Pro in March 2016, but we see limited traction for these devices within the enterprise space.

APPLE IPAD AND MAC SHIPMENTS (in million units, quarterly)



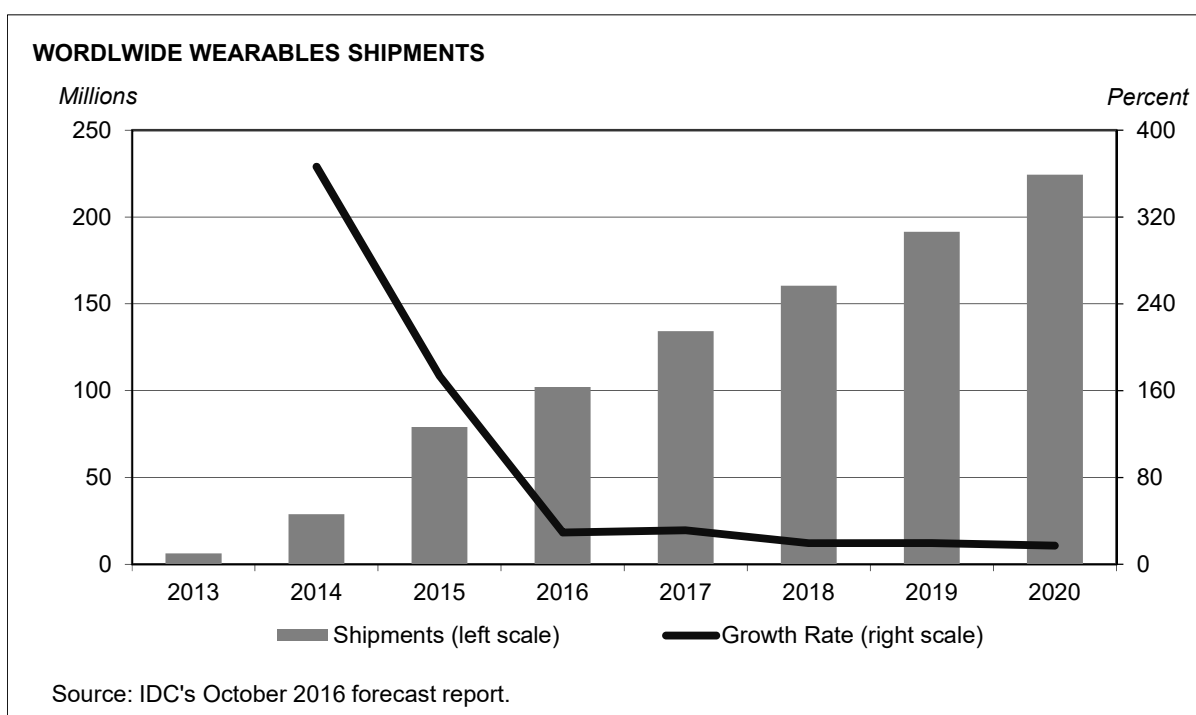
*Data for iPad started with second quarter figures. †Estimated.

Source: S&P Capital IQ.

◆ The iPad is the market share leader within the tablet space, but it has witnessed year-over-year declines for several quarters now. While shipments fell in the March and September quarters of fiscal 2016, iPad revenue finally witnessed an end to the bleeding, reflecting improvement in selling prices since the release of the iPad Pro.

◆ While traditional Window-based PCs account for about 90% of the total market, Apple's Mac products have outperformed the total space. Given the Mac's higher selling prices and margins, it remains an important business for the company.

◆ The declines seen for iPads largely reflect the maturation of the overall tablet space. Going forward, CFRA expects declines to begin to moderate as comparables become easier to access and consumers eventually replace older devices.

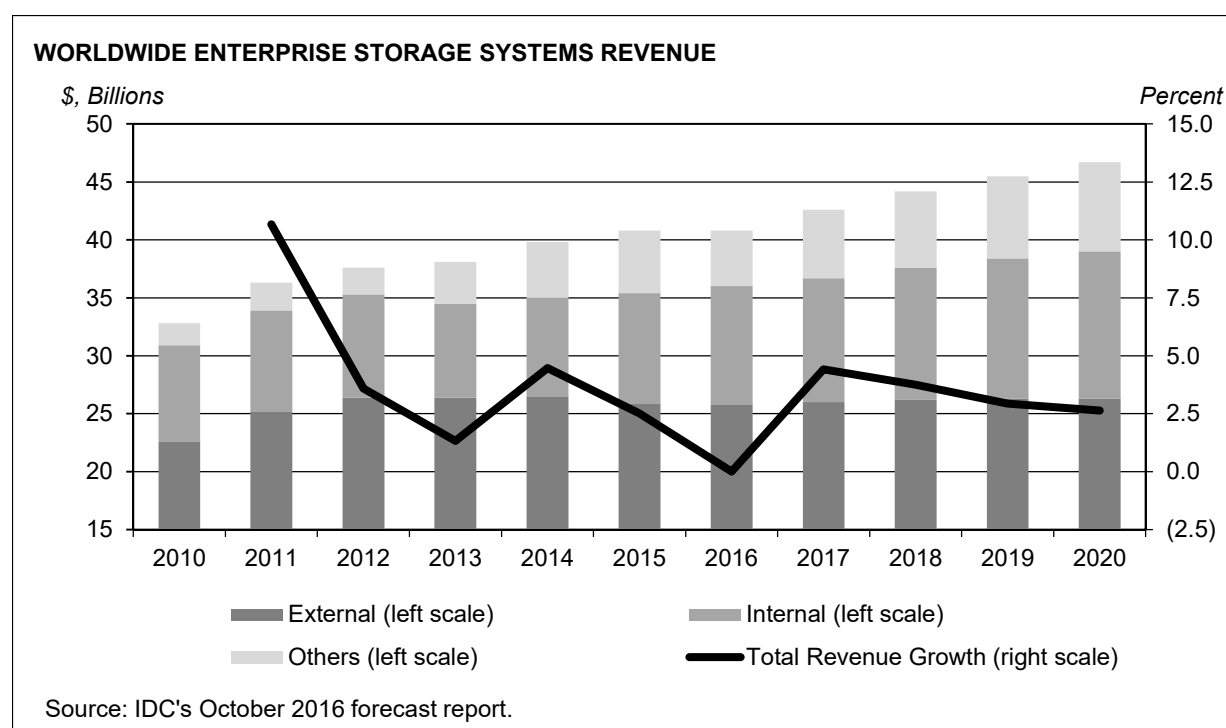


◆ Shipments of wearable devices will likely increase 25%–35% in 2017, according to CFRA, near the estimated 29% level for 2016. While adoption rates have increased, which will result in decelerating growth in the coming years, we expect strong growth this year, driven by the emergence of untethered devices into the market. The wearables segment more than doubled in 2015 to 79.0 million units, albeit from low levels (28.9 million units sold in 2014), according to IDC.

◆ While health and fitness trackers dominated the wearables market in the past, smart wearables (*i.e.*, the Apple Watch) are likely to drive the segment to relevance. CFRA thinks that the Apple Watch has helped drive consumer interest into the category and that it has also led to other device manufacturers following suit with similar launches.

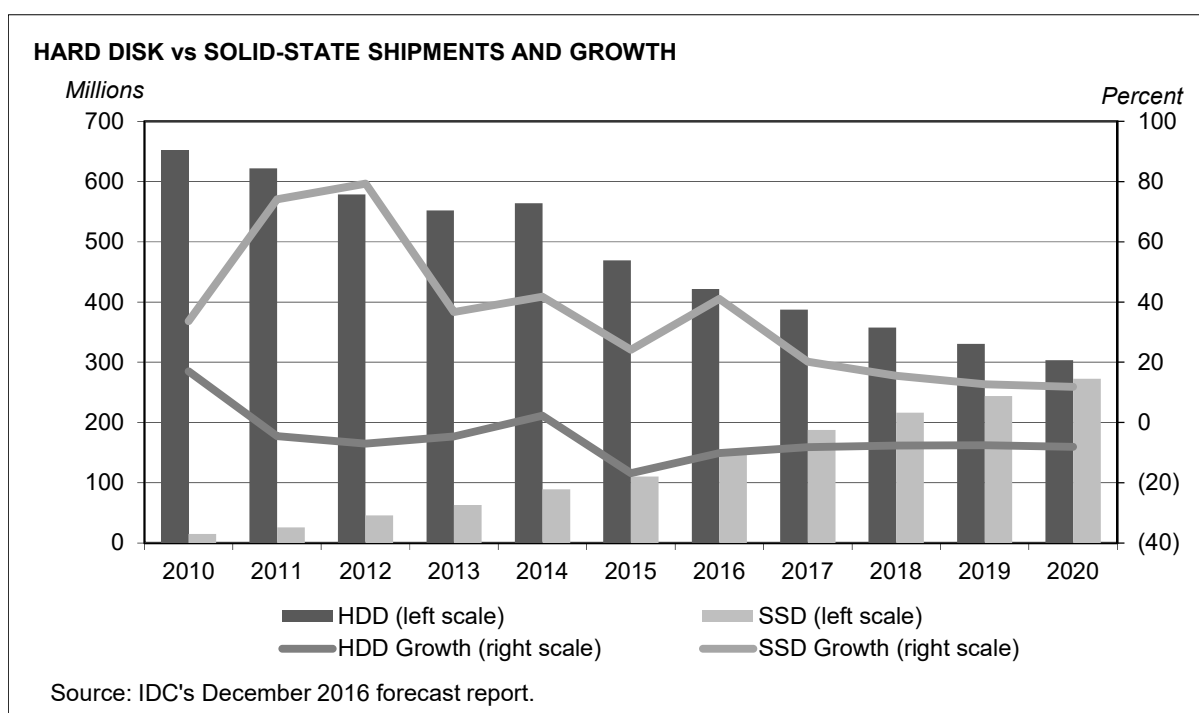
◆ Wrist products (watches, bands, bracelets, and others) will likely garner most of the attention and revenue early on, but the potential for wearables is never-ending. CFRA also thinks eyewear will be an important contributor in the coming years, as virtual reality within the gaming arena plays a big role in driving the adoption of these devices.

- ◆ The Apple Watch Series 3, expected to be released in the fall of 2017, is touted to be a major update, with an anticipated front-facing FaceTime camera that will appeal to consumers, among other features.
- ◆ The storage arena, led by market share leader Dell Corp. (following the completed acquisition of EMC Corp. in late 2016) has had its share of challenges in recent years.
- ◆ The biggest headwind within the storage space will likely be the increasing adoption of the cloud within the enterprise space. In addition, the industry has to cope with economic uncertainty in regions like Europe and Asia, as well as the corporate world holding onto systems longer because of tighter budgets and the shift toward more efficient storage devices.
- ◆ A flat to low-single-digit growth environment is the best case scenario for enterprise storage systems in 2017 and 2018, in CFRA's view. We expect competitive pressures to remain intense, which will put downward pressure on prices.



- ◆ The hard disk drive (HDD) space was hurt by a steep decline in PC sales in 2015 and 2016. A declining sales environment for HDDs is likely for the foreseeable future, given end-market dynamics and the increasing penetration of solid-state drives (SSDs). While data centers and hybrid storage systems are positives, CFRA expects the cloud and slower growth for consumer storage solutions to act as notable headwinds. We note that all-flash arrays are also growing in popularity, further impeding the long-term prospects for HDDs.
- ◆ SSDs will significantly outgrow the HDD market over the next four years, in CFRA's view. Increased SSD adoption in PCs (both portable and desktops), and greater penetration into the enterprise market, will likely drive strong growth.

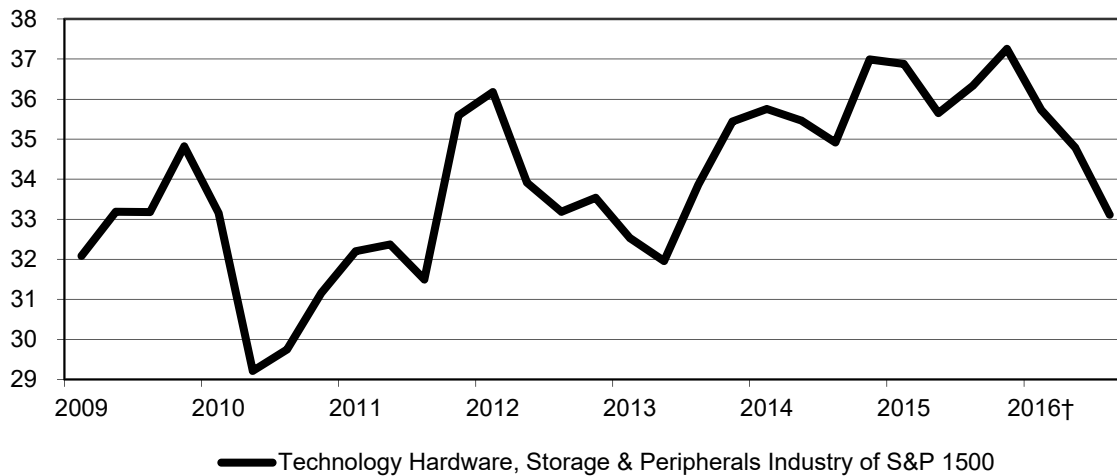
◆ Price points for both HDDs and SSDs will likely decline in 2017 and 2018, but less so than over the past decade. However, ongoing SSD price declines will make SSDs appear more attractive in comparison with HDDs.



Industry Profit Margins

- ◆ Limited upside potential to industry gross margins are likely in the foreseeable future, with pricing pressure offsetting a higher volume and new product launches.
- ◆ Gross margins are expected to remain in the mid-30% range. CFRA thinks storage providers such as NetApp will command the highest margins in the industry (in the low- to mid-60% range). The PC and HDD vendors (Hewlett-Packard, Western Digital, and Seagate Technology) will likely continue to post below-average metrics (in the 20% range). Apple, the biggest constituent, is expected to post quarterly margins modestly above the industry average (in the mid- to high-30% range).
- ◆ PCs, tablets, and smartphones are all likely to witness pricing pressure, as consumers remain price sensitive and as Asia and emerging markets see greater shipment representation in the coming years.
- ◆ After a soft patch in the first half of 2016, earnings before interest, taxes, depreciation, and amortization (EBITDA) margins are estimated to have widened in the second half of 2016. CFRA sees further improvement in 2017 and 2018, driven by increasing volume and tight cost controls. These factors should drive earnings leverage.

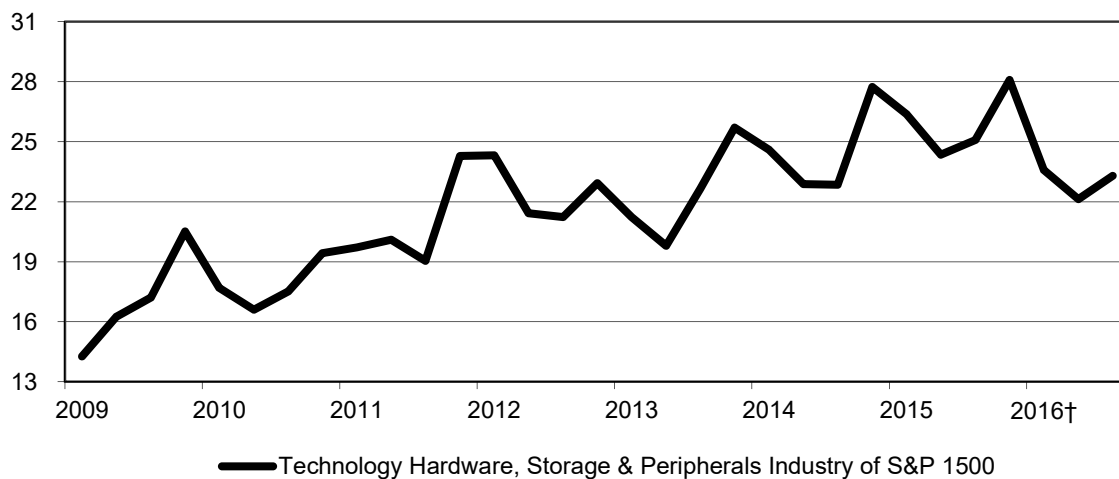
GROSS MARGIN*
(in percent, quarterly)



*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index. †Data through third quarter.

Source: S&P Capital IQ.

EBITDA MARGIN*
(in percent, quarterly)



*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index. †Data through third quarter.

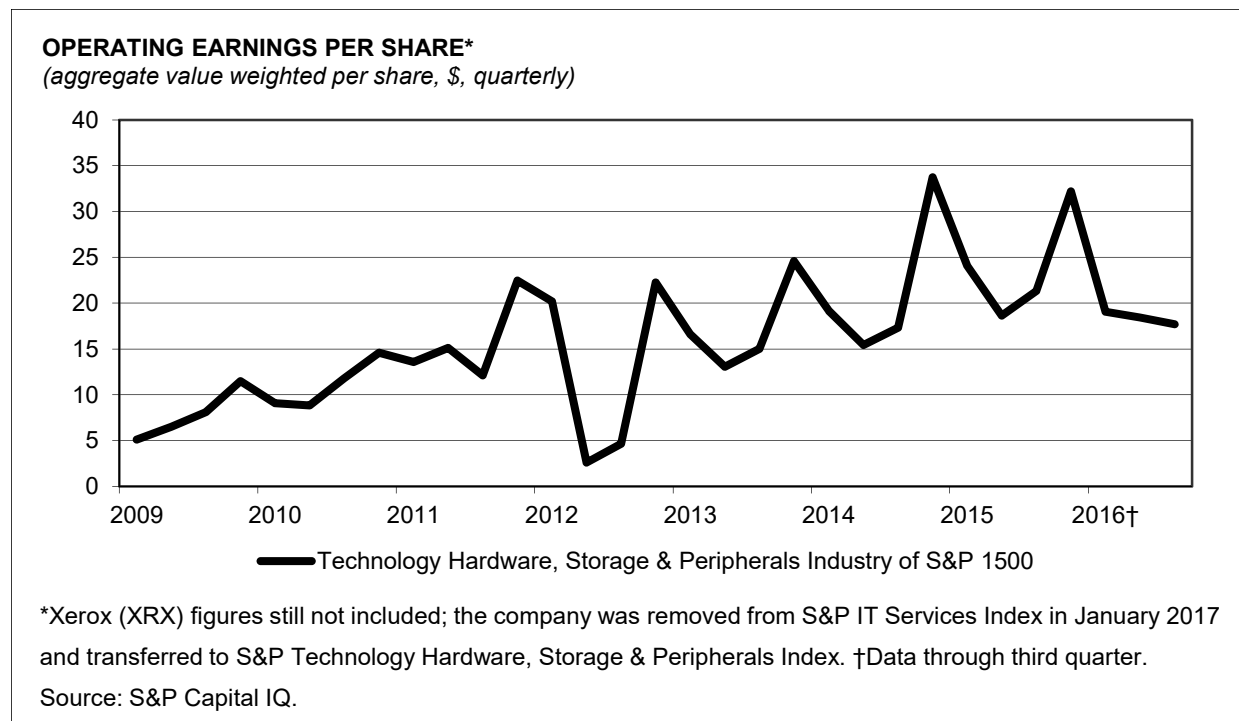
Source: S&P Capital IQ.

◆ Quarterly margins will continue to see some volatility, but this is highly dependent on seasonal factors and the timing of new product ramps.

◆ Apple's EBITDA margin will likely widen modestly in fiscal year 2017 and 2018, after compressing in 2016. Over time, the company should benefit from a greater shift of revenue from its higher-margin services business.

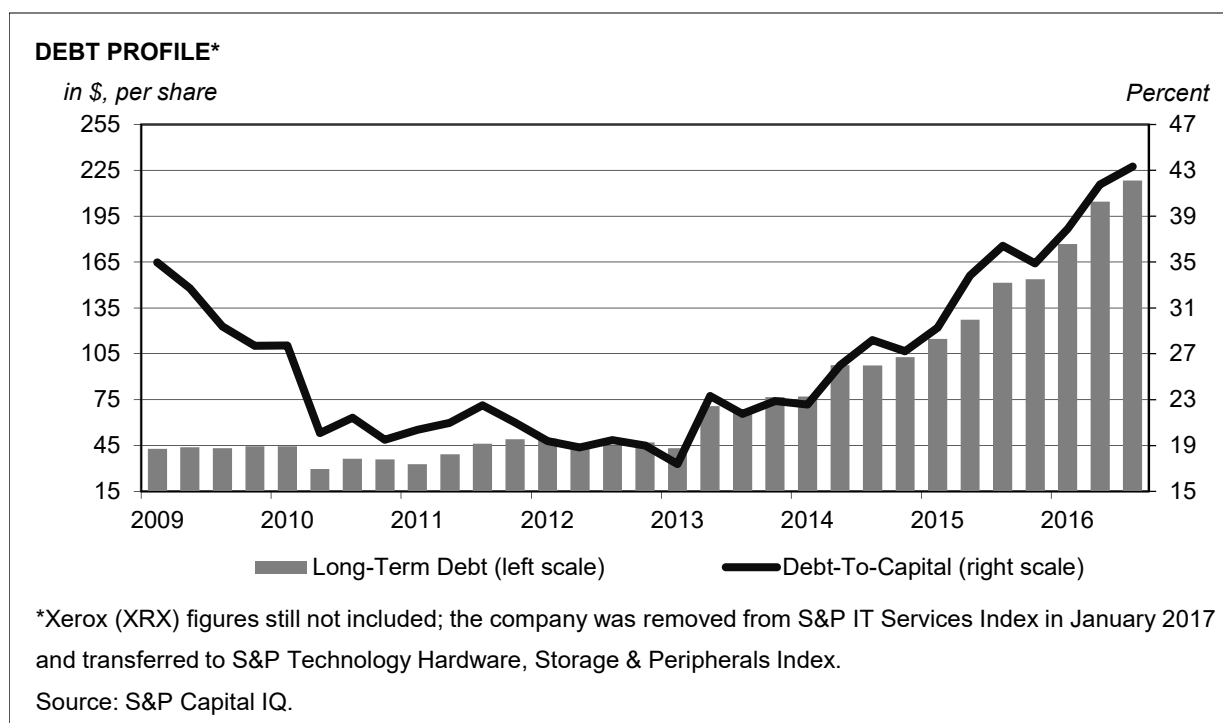
Industry Earnings

- ◆ After a challenging 2016, operating earnings per share (EPS) will likely increase in 2017 and 2018, albeit with periods of lumpiness; rising smartphone sales and greater leverage will be the key drivers of EPS.
- ◆ Given Apple's iPhone product ramps in the past (next-generation releases typically occur in September), quarterly EPS is expected to reach peak levels during the fourth quarter of each calendar year.
- ◆ CFRA anticipates greater focus on share repurchases, aiding earnings growth, as revenue growth begins to decelerate due to more challenging comparables over the next 12 months.



Industry Balance Sheet

- ◆ Long-term debt has been on the rise since early 2013, which CFRA notes is when treasury yields reached their lowest point. Not surprisingly, debt for hardware manufacturers has increased ever since, as corporations look to take advantage of historically low interest rates ahead of a potential rise in yields.
- ◆ Since early 2013, Apple has issued more than \$75 billion in long-term debt. This approach is a change in the company's capital structure, as it did not hold long-term debt in prior years.
- ◆ Both hardware and storage manufacturers are likely to remain active in the debt markets, given the ongoing low interest-rate environment.



◆ Historically, cash has been an important line item because behemoth technology companies have so much of it and generate a significant amount of free cash flow. CFRA expects cash levels to remain healthy in the foreseeable future. However, rather than focus on increasing their cash position, manufacturers will likely look to sustain cash at stable or flat levels while focusing on returning more excess cash to shareholders.

◆ Given the ample amount of cash on hand that the industry possesses, companies are likely to focus on a mix of more aggressive share repurchases, dividend increases, and opportunistic acquisitions. CFRA expects Apple, with more than \$238 billion in cash, to use excess cash more toward share repurchases. HP, shoring up its balance sheet following some disastrous acquisitions, appears to be more likely to take the merger and acquisition (M&A) approach. In May 2015, HP acquired Aruba Networks for \$3 billion. In late 2016, Dell acquired EMC in the largest-ever acquisition announced in the information technology sector.

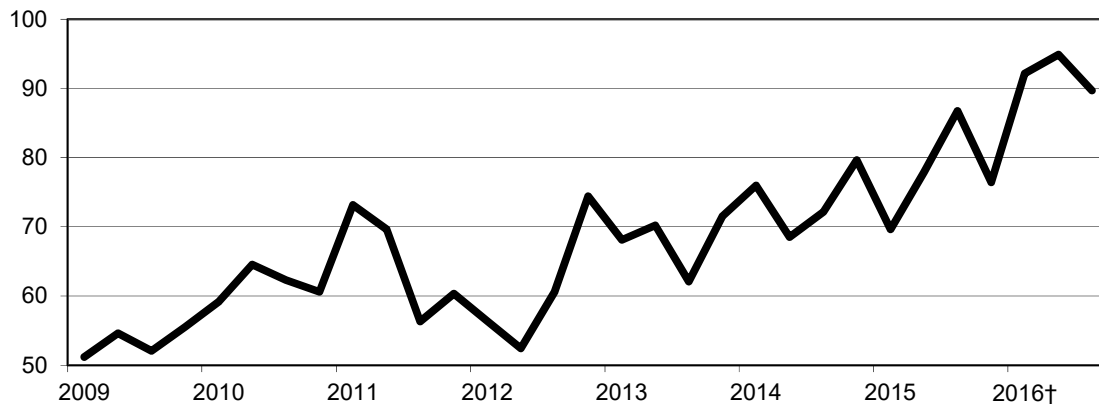
◆ The decelerating growth rates, high activist interest, and healthy free cash flow generation will help support greater cash usage of the hardware/storage manufacturers, in CFRA's view.

◆ Free cash flow will likely remain attractive and improve from current levels. CFRA thinks this is an important metric for investors to consider, as we see an increasing portion of free cash flow being returned to investors via share repurchases and dividends.

◆ While CFRA expects free cash flow margins to continue to improve. As corporate profits outpace top-line growth, we anticipate that a significant amount of the free cash flow generated will come overseas. As a result, corporations will likely be limited to some extent on how cash is used.

CASH AND CASH EQUIVALENTS*

(aggregate value weighted per share, \$, quarterly)



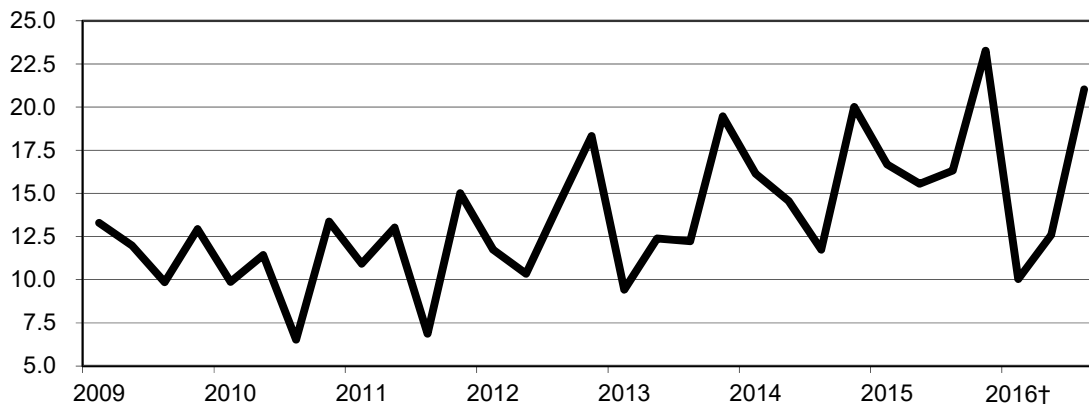
— Technology Hardware, Storage & Peripherals Industry of S&P 1500

*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index. †Data through third quarter.

Source: S&P Capital IQ.

UNLEVERED FREE CASH FLOW MARGIN*

(in percent, quarterly)



— Technology Hardware, Storage & Peripherals Industry of S&P 1500

*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index. †Data through third quarter.

Source: S&P Capital IQ.

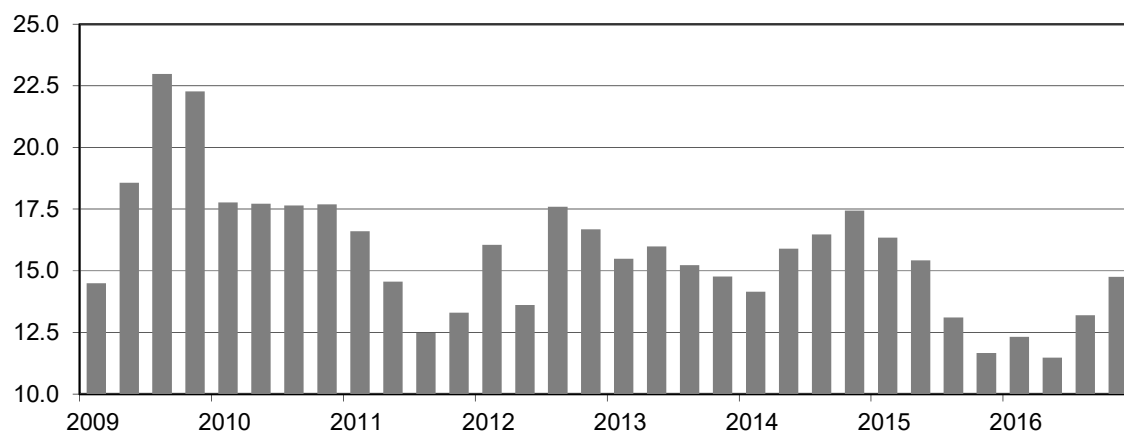
Industry Valuation

◆ Multiples for the technology hardware, storage & peripherals expanded in the second half of 2016 and CFRA sees further margin expansion potential in the coming quarters, as we envision smartphone growth accelerating and PC pressures moderating.

◆ The industry price-to-earnings ratio (P/E) multiple saw significant margin compression in 2015 into early 2016, reaching the lowest levels seen in the past five years during the second quarter of 2016. CFRA attributes the multiple compressions over this period to challenges within the smartphone segment, the largest end market for hardware manufacturers.

PRICE-TO-EARNINGS PER SHARE RATIO*

(in multiples, quarterly)



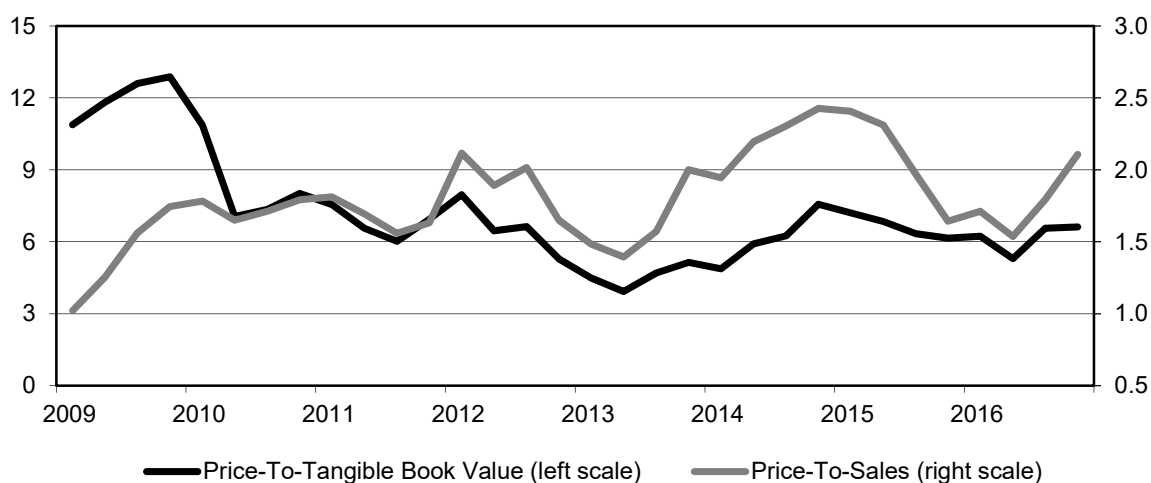
■ Technology Hardware, Storage & Peripherals Industry of S&P 1500

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Source: S&P Capital IQ.

PRICE-TO-TANGIBLE BOOK VALUE AND PRICE-TO-SALES RATIOS*

(in multiples, quarterly)



— Price-To-Tangible Book Value (left scale) — Price-To-Sales (right scale)

*Xerox (XRX) figures still not included; the company was removed from S&P IT Services Index in January 2017 and transferred to S&P Technology Hardware, Storage & Peripherals Index.

Source: S&P Capital IQ.

- ◆ CFRA sees upside potential to consensus estimates in 2017 and 2018, partly given our expectation that next-generation devices will improve product replacement cycles for the industry.
- ◆ With the industry P/E near the middle of its five-year historical range, CFRA sees potential for multiple expansion over the next 12 months.
- ◆ Other multiples, specifically price-to-sales and price-to-book ratios, have trended along with P/E expansion since bottoming in the first half of 2016.
- ◆ Similar to P/E metrics, CFRA sees the potential for further margin expansion, as valuations are currently around the middle of their historical range. Ratios for low multiple areas (*i.e.*, PCs, printers, HDDs, and others) will likely widen if manufacturers are successful with adjacent market expansion.

INDUSTRY TRENDS

A favorable environment for the global technology hardware, storage & peripherals industry is expected in the coming quarters. A number of factors can contribute to this, in CFRA's view, including an acceleration of growth in the smartphone space, ongoing (albeit less pronounced) declines in PC spending, and robust data growth driving opportunities within the data center segment. We see improving corporate profit growth for the technology hardware, storage & peripherals industry in 2017 and 2018, with next-generation mobile devices driving top-line growth.

Competitive Environment

Personal Computers

In 2016, worldwide PC shipments were estimated to have dropped 6.4% due to some volatility in emerging regions, offset by steady gains in larger mature markets, according to research firm International Data Corp. (IDC). US shipments decreased 1.0% in 2016 from a 2.6% increase in 2015, and they are projected to decline at a 1.8% compound annual growth rate (CAGR) in the five-year period ending 2020. In 2015, PC shipments dropped 10.6% worldwide. However, unstable commodity prices, currency fluctuations, and tense political conditions continue to affect the near-term outlook for the global PC market, which is expected to decline at a -1.9% CAGR from 2015 through 2020.

Lenovo Group Ltd. maintained its top rank in the fourth quarter of 2016, with a 22.4% market share (up from 21.6% in the fourth quarter of 2015). This was followed by Hewlett-Packard Co. (HP), at 21.7% (20.1% in the prior-year period); Dell Inc., at 15.7% (14.3% in the prior-year period); Apple, at 7.5% (7.4% in the prior-year period); and ASUS, at 7.4% (8.2% in the prior-year period). Lenovo continued to be the top player in the fourth quarter of last year, despite challenges the company faced in the Asia-Pacific and Japan regions. The company did very well in the European and American markets during the holiday season last year, increasing shipments 1.7%, year over year, and ending the six consecutive quarters of year-on-year declines. HP ranked second in the worldwide market, growing 6.6% compared with the prior-year period and shipping more than 15 million units for the first time since the fourth quarter of 2014. HP saw gains in Europe, the Middle East and Africa (EMEA), and the Asia-Pacific (APAC) and Japan regions.

The growth of Chrome, Bing, all-in-one PCs, ultra-slim PCs, convertibles, and touch systems could help stabilize the worldwide PC market in the coming years. For the US PC market, flat to slightly lower shipments are estimated for 2016, reflecting a lack of innovation from manufacturers as they chose to focus on cost cutting, sluggish macroeconomic growth, and a challenging IT spending landscape. Nonetheless, an aging PC environment will likely allow for the replacement of older PCs.

Feature Phones and Smartphones

Over the last decade, smartphones have gradually replaced traditional mobile phones (feature phones), and CFRA expects this trend to continue. The ratio of feature phones to smartphones could change from 25.4%/74.6% in 2016 to 13.6%/86.4% by 2020, according to IDC. For 2017, the gap between feature phones and smartphones is expected to widen to 23.3%/76.7%. In addition, IDC predicts that feature phone shipments will decline at a 13.0% CAGR from 492.7 million in 2016 to 270.1 million in 2020, whereas smartphone shipments will grow at a 3.5% CAGR from 1.4 billion in 2016 to 1.7 billion in 2020. In 2016, feature phone shipments declined 9.2%, year over year, to 492.7 million, while smartphones grew 0.6%, year over year, to 1.4 billion.

IDC reported that Samsung maintained the top spot in the worldwide smartphone market for the third quarter of 2016 (latest available), accounting for a 20.0% share, with Apple following at 12.5%. Huawei accounted for 9.3%; OPPO, 7.0%; Vivo, 5.8%; and others, 45.4%.

The worldwide smartphone market posted 1.0% year-over-year growth for the third quarter of 2016, with 362.9 million units shipped compared with 359.3 million units in the prior-year period, according to IDC's "Worldwide Quarterly Mobile Phone Tracker." IDC estimates a 1.5-billion unit shipments for full-year 2016, up 1.6% from the record-high shipments in 2015.

By region, North America is estimated to have accounted for 12.5% of global smartphone shipments in 2016; APAC, 51.8%; Europe, EMEA, 26.0%; and Latin America, 9.7%, according to IDC. In 2017, shipments are expected to be 12.2% for North America, 52.1% for APAC, 26.0% for EMEA, and 9.6% for Latin America. By 2020, the geographic shipment distribution is expected to shift to 11.0% for North America, 52.9% for APAC, 25.8% for EMEA, and 9.3% for Latin America. Between 2015 and 2020, smartphone shipments are projected to grow at a CAGR of 1.0% in North America, 4.6% in APAC, 3.2% in EMEA, and 2.2% in Latin America.

Most mobile phone suppliers are turning their focus to smartphones, as demand is largely driven by replacements by current users and first-time users, a broad selection of models for end users, and prices that fit nearly every budget. These factors will likely contribute to an overall increase in the demand for smartphones.

Tablets

Worldwide tablet shipments declined 14.7% in the third quarter of 2016 (latest available) compared with the prior-year period, as end users shifted their demand toward detachables, according to IDC. It is estimated that worldwide tablet shipments for full-year 2016 decreased 11.5% year over year. Over the next several years, CFRA expects shipments to grow at a low single-digit annualized pace. The use of tablets has increased in the commercial and enterprise arena. The ratio of consumer/commercial tablet shipments is expected to shift from an estimated 84.7%/15.3% in 2016 to 78.1%/21.9% by 2020, according to IDC.

Consumers are gearing toward tablets with larger screen sizes, *i.e.*, larger than eight inches. Shipments of devices with a sub-eight-inch screen size will decline at an 8.6% CAGR between 2015 and 2020, according to IDC, while those with an above-eight-inch screen size will grow at a 7.0% CAGR. Apple accounted for 23.9% of global tablet shipments in 2015; Samsung, 16.2%; Lenovo, 5.4%; ASUS, 3.4%; Huawei, 3.1%; and others, 48.0%, according to IDC data.

In June 2016, IDC estimated that the US would account for 26.4% of global tablet shipments last year (compared with 25.0% in 2015); followed by Western Europe, 20.4% (compared with 18.8%); Japan, 3.5% (compared with 4.0%); APAC (excluding Japan), 24.6% (compared with 25.6%); and the rest of the world (ROW), 25.0% (compared with 26.6%). Between 2015 and 2020, tablet shipments could grow at a 4.1% CAGR in the US, 2.6% in Western Europe, and 1.0% in ROW, and could decline at a 2.5% CAGR in Japan and 3.9% in APAC (excluding Japan).

The tablet market has quickly gone from high growth to a mature market over the last two years. This device category appears to be squeezed by the surge of large smartphones and longer user ownership cycles. In November 2015, Apple launched its larger iPad Pro, which was intended to help spur demand within the enterprise arena, a segment that Apple has yet to penetrate. Meanwhile, the launch of Microsoft's Windows 10 appears to have been well received, with healthy upgrade rates. In addition, growth of connected tablets and cellular capable tablets (phablets) will likely persist, emphasizing the importance of portfolio strategy for vendors offering

both tablets and phablets. The tablet market is forecast to return to positive growth in 2018 through 2020, with shipments estimated to reach 194.2 million units as detachable tablets continue to steal market share from traditional PCs, according to IDC.

Wearables—Healthy Growth for 2016 and Beyond

The wearables market reached its inflection point in 2015, in CFRA's view, with shipments up 175%, year over year, according to IDC, before dropping to an estimated 102% growth in 2016. The market is expected to post growth at a compounded annualized pace of about 23% over the next five years. Survey results reported by PricewaterhouseCoopers (PwC) in May 2016 showed that 49% of the respondents own at least one wearable device (with 36% owning more than one), up from 21% in 2014. In particular, IDC estimates that smartwatch shipments grew 3.9% in 2016 compared with 2015.

Smart wearables, or devices with access to third-party applications, are expected to drive mainstream consumer adoption, surpassing the basic health and fitness tracker devices that dominated the market in the past. Smart wearables are expected to post a CAGR of 37% over the next five years, compared with the projected 18% annual growth for the basic wearables, based on IDC estimates.

The most anticipated wearable device that came to market is the Apple Watch. This product marked Apple's entry into the wearable category and was a key driver for consumers migrating to the new market. Apple has proven itself a visionary leader with regard to releasing new products, and pioneering and perfecting new categories (*i.e.*, the iPod in portable music players, the iPhone in smartphones, and the iPad in tablets); hence, CFRA sees notable opportunity and potential. The Apple Watch started pre-orders on April 10, 2015 and began shipping on April 24. Apple Watch generated 12–13 million shipments during the first full year, with revenues between \$6.0 billion and \$6.5 billion. The watch set a solid foundation for the industry, in our view, and helped excite the market and educate consumers on the benefits of wearable devices. The launch should not only benefit Apple, but also other hardware makers as adoption ramps up.

While wrist products such as watches, bands, and bracelets are garnering most of the revenue in the wearables market today (over 90% of total market shipments), CFRA thinks the potential for wearables is never-ending. The concept of the "Internet of Things" will likely contribute to a much more expansionary market, where Internet-enabled consumer products will include jewelry, clothing, and cameras, among other things.

CFRA expects Apple to release a "tetherless" device (less tied to a smartphone) by year-end 2017. We also expect hardware manufacturers to focus more on driving the next major leg for the smartwatch space. By 2020, eyewear and clothing are expected to contribute more to the wearables market, although smartwatches/bands are still projected to lead, representing over 80% of volume.

Operating Environment

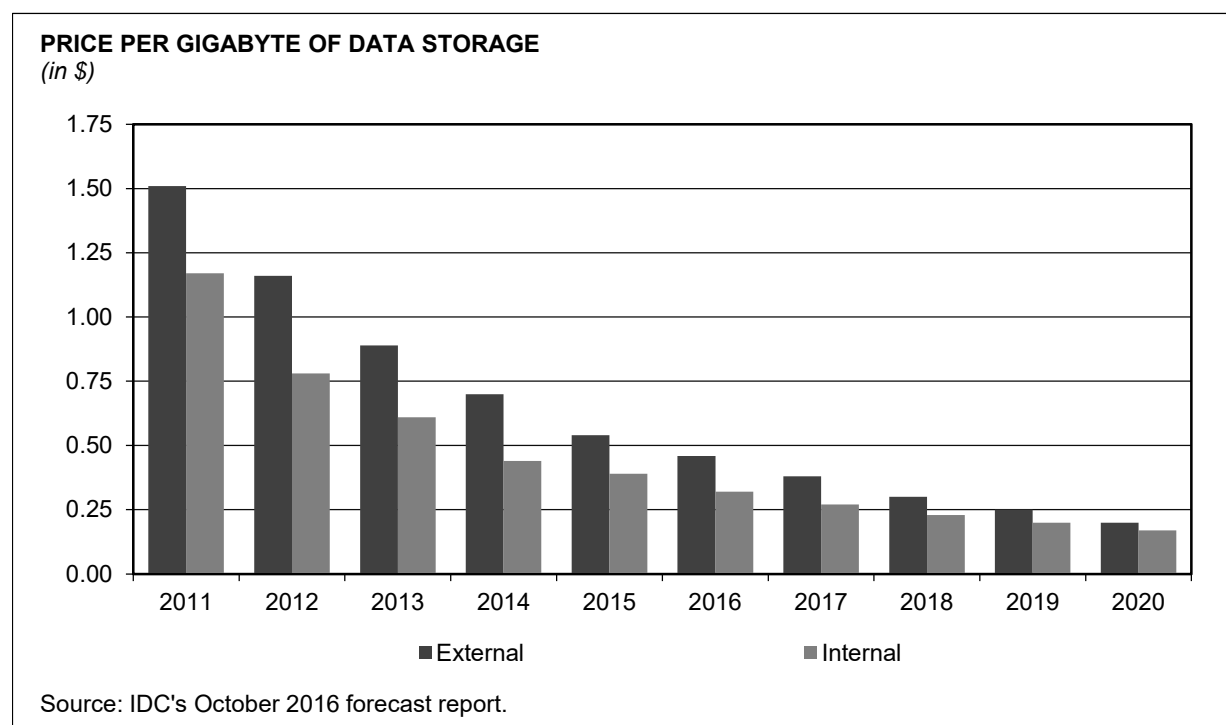
Server Market to Witness Slow Growth

Ongoing server consolidation, technology transitions, and challenging macroeconomic conditions across the globe will continue to have an adverse effect on the server market, in CFRA's view. Worldwide spending on servers totaled \$56.9 million in 2016, according to IDC (December 2016). IDC expects this spending to grow at a 4.2% CAGR between 2015 and 2020. Meanwhile, server unit shipments are projected to increase at a 4.4% CAGR between 2015 and 2020. As of

the third quarter of 2016 (latest available), worldwide server shipments reached \$12.5 billion, down 7.0% compared with the prior-year period due to a slowdown in hyperscale data center growth and a continued decline in high-end server sales.

There is an increasing trend toward form factor specialization in the market, as both blade and density-optimized servers outperform the general market. These modular form factors are expected to gain adoption with virtualized environments focusing on blades and with large-scale homogeneous environments in data centers focusing on density-optimized servers. The share of bladed server revenue to total server revenue is expected to decline slightly from 16.4% in 2016 to 13.7% by 2020, according to IDC estimates. The growth in the cloud computing market is expected to drive growth in microservers. With lower space requirements, improved performance, and greater cost efficiency, microservers are used largely in cloud data centers. Cloud IT infrastructure spending (including server, storage, and Ethernet switch) is expected to grow at a 12.5% five-year CAGR to \$57.8 billion in 2020, according to IDC. In addition, the demand for microservers will continue to be driven by the ongoing buildup of scale-out data centers running multiple workload applications, intending to reduce unutilized processing capacity for lightweight workloads.

CFRA thinks that increasing pressure on IT budgets will drive IT organizations to leverage the operational benefits of the blade platform, by migrating from a complex heterogeneous legacy server environment to a managed blade environment. The spending for high-end enterprise servers will continue to decline as users continue to migrate to lower-cost modular systems.



The Internet, Digitization, Regulation Drive Enterprise Data Storage

The amount of data that enterprises generate is growing at an exponential rate. Business processes that used to be done on paper are being computerized. For example, all modern airplanes are designed using computer-aided design (CAD) software. This software enables testing to be done in a computer simulation rather than the traditional method of building physical prototypes, resulting in faster analysis and lower production costs.

There are several other drivers for the data storage explosion, in CFRA's view. In addition to the pervasive use of computing technology, we think the growth of the Internet and e-commerce has increased the need to record data. We also think the increased usage of rich media content, which includes broadcast and shared audio, graphics, and video, has been a major factor for increased demand on data storage.

Globally, CFRA thinks the growth in emerging markets is also driving the increased need for regulation and oversight, as is the case with the enactment of the Japanese version of Sarbanes-Oxley, which requires firms to submit internal control reports on a consolidated basis starting with the fiscal years commencing on or after April 1, 2008. The requirements for J-Sox, as it is popularly known, will be modeled on the US version in many ways and will therefore require many of the same data storage, archival, and retrieval technologies.

These requirements will likely boost overall interest in storage-related products because existing levels of capacity are likely to be insufficient to hold ever-expanding quantities of data. Under Sarbanes-Oxley, information needs to be stored for at least seven years. In addition, information must be protected, unaltered, well organized, and easily accessible. The protection aspect is a key component of the new law: It requires that records be stored in an unalterable way in order for them to be certified. Although the overall impact of compliance with these measures is still being determined, it will certainly force IT managers to reevaluate their ability to handle the potential inflow of large quantities of vital information.

Partially offsetting the rapid growth in the demand for enterprise data storage is the price decline in the cost per gigabyte of storage. Most critical data are stored on hard disk drives (HDDs). Due to new developments in HDD technology, such as perpendicular recording, the aerial density of disk storage devices has increased dramatically, similar to Moore's law in computing hardware, thus enabling more data to be stored on the same amount of physical space.

The Evolution of the Data Center

The way we compute has evolved through the years. During the 1970s and 1980s, the dominant computing platform was the mainframe computer. Mainframes were the most powerful computers available, but were expensive. They also required a special environment in which to operate. Since all of the computing was done at a central location, it was also called "centralized computing." Companies ran multiple applications on a single mainframe machine to maximize their return on investment. It was common to find mainframes with peak utilization rates of more than 90%.

The mainframe computers were displaced in the late 1980s and early 1990s with the rise of PCs and low-cost servers, which established the model of distributed computing. PCs were cheap and could be deployed anywhere. Departments and other subgroups could purchase them and develop applications outside the control of a centralized IT environment. Consequently, most software applications were developed without any standard processes, and followed a one-application-to-one-server model.

As applications become more mission critical, the servers were moved into formal data centers. A data center is a facility used to house computers, networks, and storage systems. It generally includes redundant or backup power supplies, redundant data communications connections, air conditioning, and fire suppression and security devices. It also contains automated systems that constantly monitor server activity, Web traffic, and network performance.

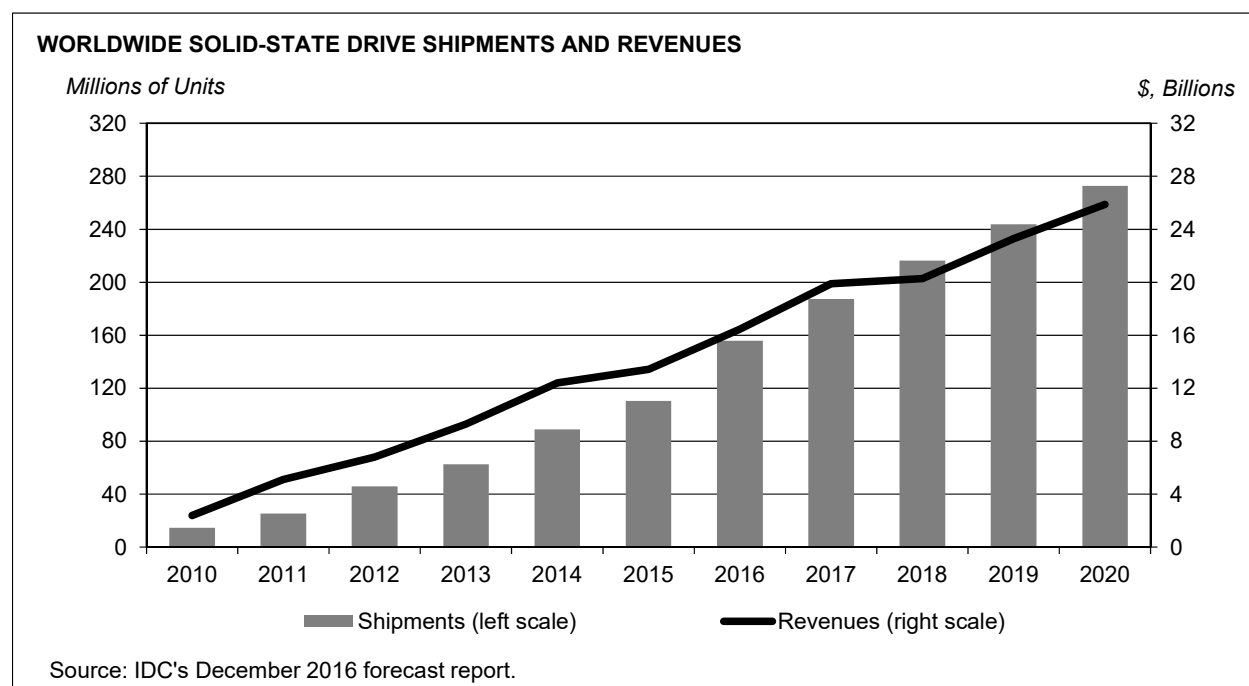
The number of servers has proliferated, as more software applications are written. Each new application would require at least one additional server. More would be required if a company planned to develop and test each application on a separate server. The growth in the number of servers has accelerated due to the rise of the Internet.

The task of managing a data center has become increasingly difficult. Many data centers have simply run out of space. Another problem has been rising energy costs, which typically account for 40% of the cost of operating a data center. These two issues have been exacerbated by the fact that most servers are using only a fraction of their processing power. Data center operators describe the condition of having a large number of servers running at very low utilization as “server sprawl.”

Virtualization can alleviate server sprawl by consolidating many different types of workloads and operating systems onto virtual environments, all running on a single hardware platform. Using servers more efficiently involves fewer processing cycles; this, in turn, reduces cooling and ventilation requirements, along with energy usage. These benefits are consistent with the drive to be “green,” or environmentally friendly.

HDDs Versus SSDs

Hard disk drives (HDDs), which store data magnetically on rotating rigid platters on a motor-driven spindle, offer several key advantages over other forms of electronic data storage. They can provide high storage capacity at relatively low costs, along with relative high-speed performance.



Solid-state drives (SSDs) are an alternative to HDDs. SSDs record, store, and retrieve digital data using integrated circuits (ICs) rather than magnetic. Because they do not have any moving parts, SSDs have faster read/write speeds. They also generate less heat and have lower power consumption. SSDs can come in smaller form factors than HDDs. However, SSDs are currently much more costly per GB and are available in much lower capacity points than hard drives.

SSDs will hurt sales of HDDs over time, in CFRA's view, but not enough to prevent growth of HDDs. We see increased usage of SSDs in devices in which the advantages of SSDs, such as lower power consumption and smaller form factors, outweigh its main disadvantage, its price. Thus, we think SSDs will make inroads in PCs, tablet computers, smartphones, and other mobile consumer electronic devices. We also see SSDs targeting enterprise applications, where the value proposition is based on cost per transaction or cost per input/output (I/O), rather than on cost per megabyte.

HOW THE INDUSTRY OPERATES

Computer Form Factors

Just about every kind of computer comes in a variety of “form factors”—physical designs that play a large role in determining the computer’s potential uses and markets. The most common form factor distinction in the PC market is that between desktop and laptop (or portable) computers. Laptops contain similar electronics as desktops, but they must also meet a unique set of requirements, such as reduced power usage and heat generation.

Tablet computers are a form factor somewhere between netbooks and laptops. In 2010, Apple scored a hit in the tablet category with the introduction of its iPad product. (Note that many market researchers, including International Data Corp. (IDC), count devices like the iPad as a media tablet, and not as a tablet PC, which has a more robust, PC-like operating system.) The high consumer appetite for tablets has essentially eliminated the netbook market following the boom of 2009 and early 2010.

Servers and workstations also come in a variety of form factors. In the past decade, “blade” or rack-optimized servers, which are simply circuit boards designed to standard specifications, have become popular with corporations and other enterprises. They allow customers to create standardized, expandable computer racks and easily add or remove individual servers.

Over the last few years, smartphones or mobile phones with increased functionalities (Internet access, media player, global navigation system (GPS), mobile payment, to name a few) and applications have been replacing traditional mobile phones. Most smartphones now have touchscreen interface, which was revolutionized by the launch of the first iPhone in 2007. Android is the dominant operating system for the smartphones, followed by iOS.

Among the promising devices in recent years are wearables. These devices can be used as accessible extensions of other consumer devices such as smartphones, tablets, or PCs.

Assemblers, Distribution, Marketers, and Manufacturers

Technology hardware, storage & peripherals manufacturers look to sell innovative and differentiated products and to employ knowledgeable salespeople who can convey the value of the hardware and software integration, and demonstrate the unique solutions that are available on its products.

Some technology hardware, storage & peripherals manufacturers, such as Apple, look to build and improve their distribution capabilities by expanding the number of their own retail stores worldwide. These retail stores are typically located at high-traffic locations in quality shopping malls and urban shopping districts. By operating its own stores and locating them in desirable high-traffic locations, Apple is well positioned to ensure a high-quality customer buying experience and attract new customers.

Companies like Apple and Microsoft are also committed to delivering solutions to help educators to teach and students to learn. These manufacturers believe that effective integration of technology into classroom instruction can result in higher levels of student achievement, and they have designed a range of products, services, and programs to address the needs of education customers.

Manufacturers such as Apple and Microsoft sell their products to the education market through their direct sales force, select third-party resellers, and their online and retail stores.

Achieving the proper balance between direct and indirect sales initiatives can be problematic. Direct sales can lower costs, but maintaining a strong partnership with distributors is critical to computer hardware vendors serving the enterprise market. In addition, sales of hardware through retail outlets—including manufacturers' retail locations as well as mass merchandisers, consumer electronics retailers, computer superstores, warehouse clubs, and office products stores—have accelerated as consumer purchases have accounted for a growing percentage of hardware sales. Growth in this area has come at the expense of other distribution channels.

Companies in the technology hardware, storage & peripherals industry also sell their hardware and software products to enterprise and government customers in different geographic segments. These customers often choose products based on performance, productivity, ease of use, and seamless integration into information technology environments.

Seasonal Sales Can Make or Break the Year

Technology hardware, storage & peripherals manufacturers face a variety of seasonal influences on their sales. These factors include differences in customs and business practices in other parts of the world, the retail cycle, and the year-end sales push for corporate hardware.

For vendors, the fourth quarter is traditionally the most significant revenue and earnings period. This is due to a number of factors. First, because most businesses close their books in December, managers often seek to deplete their capital spending budgets for fear of funding cutbacks the following year. Second, vendors often put significant financial incentives in place to spur the industry's legions of sales representatives to meet year-end sales goals. The fear of forfeiting large cash bonuses usually results in a sales surge during the fourth quarter.

With shipments to consumers accounting for a number approaching half of the worldwide total, the consumer market also plays a role in the seasonality of the technology hardware, storage & peripherals industry. Manufacturers now focus on gearing up for the back-to-school selling season and the later push for holiday purchases. Most vendors make substantial advertising and marketing outlays during the third and fourth quarters to capitalize on these important seasons.

In addition, many US-based technology hardware, storage & peripherals vendors derive more than 40% of their revenues from international markets. This has a significant seasonal impact on sales, as well. For example, European businesses typically experience a summer slowdown in business activity. Most vendors have adjusted their business models and expectations to reflect the longer sales cycles and uneven demand patterns during the summer period in Europe.

Demand for Data Storage Exploding

Over the past decade, the volume of data being created has exploded. CFRA attributes this to the expansion of a variety of data-intensive applications (including online transactions), multimedia devices, and, particularly, multimedia content on the Internet. For example, trillions of e-mails are generated on an annual basis. The growth in the number of instant messages and weblogs (or blogs) has only added to this phenomenon. As a result, fast and reliable data storage has become ever more vital.

This explosion of data has increased the complexity involved in managing secure access to information, leading to increased emphasis on storage software solutions. Environmental concerns also have become a key economic driver, with storage vendors addressing ways in which they can reduce the energy requirements of data centers by making storage more efficient.

Product Overview: Storage

The computer storage industry is a broad and dynamic market. CFRA's discussion focuses on the following categories: storage systems, software, components (host bus adapters and switches), disk drives, flash memory, and tape products.

Disk Storage Systems

The storage systems market is broad. Products in this arena serve the entire market spectrum, from low-end applications up to and including the enterprise segment. These systems are used for a variety of functions, including the storing, backup, prioritization, management, and disposal of critical pieces of information. IDC reported that leading providers of worldwide disk storage systems as of the third quarter of 2016 (latest available) include Dell Technologies, which accounted for 25.5% of the market; HP Enterprise (HPE), 15.5%; NetApp Inc., 6.6%; IBM, 5.9%; and Hitachi, 5.7% of the market.

A growing portion of the systems market is focused on devices that are networked, rather than attached directly to a server. Networked devices may be based on storage area network (SAN) architecture or network-attached storage (NAS) architecture (both described below). Certain operating environments use both technologies, making them complementary storage solutions. Within the total external disk storage market (NAS and SAN combined), Dell garnered a 31.6% share in the third quarter of 2016, followed by NetApp with 10.9%; HPE, 10.2%; Hitachi, 9.1%; and IBM, 8.6%.

◆ **Storage area network.** This architecture involves the creation of a private network that moves data in block format directly to servers. The storage area network (SAN) exists as a complementary network to the local area network (LAN): The creation of the SAN allows the LAN to offload some of its data-intensive traffic, thereby improving overall performance and creating a central hub for storage management.

◆ **Network-attached storage.** This architecture is attached directly to the network through a high-end server. A network-attached storage (NAS) setup converts the block data to files and delivers them over a LAN to servers or PCs.

Software

In recent years, software has become an increasingly relevant offering for storage vendors. Many companies have looked to software to supplement their existing product lines. Software has numerous advantages over hardware, including less labor-intensive manufacturing and higher gross margin potential. Intuitively, the move to distribute software makes sense. Customers that are interested in purchasing a particular hardware product often need software to run the necessary applications. A storage company that develops its own hardware/software solution can seize the opportunity to satisfy all of the customer's requirements.

Hardware providers have incorporated the "open system" concept—configuring their software so it can run on other companies' machines—into their software portfolios. In the past, they typically required customers to purchase both the storage hardware and software in a bundled package,

meaning the customer had to use the same vendor for both. Today, a customer that wants to use EMC's hardware has the option to use another company's storage software if it chooses.

Components

Components are parts used in the configuration of networked storage architectures. The two main categories within this field are host bus adapters (HBAs) and switches.

◆ **Host bus adapters.** Host bus adapters (HBAs) are cards that fit into a computer, server, or mainframe, and are linked to a storage device or storage network to allow servers to connect to storage networks. The two principal competitors in this industry segment are Emulex Corp. and QLogic Corp., which combined, dominate the market.

◆ **Switches.** Switches are devices that filter packets of information between LAN segments. There are two primary types: fabric and director class. Fabric switches typically provide fewer than 32 ports, and are deployed at the edge of a SAN. Director-class switches offer 32 or more ports, and are installed within the SAN. The two major providers in this field are Brocade Communications Systems Inc. (including acquired McData Corp.) and Cisco Systems Inc.

Switches and HBAs both use a networking technology known as Fibre Channel (FC), which facilitates the transmission of data between computer devices. Introduced in 1994, FC was the first networking technology to be widely adopted by the major industry participants. It typically transmits data at speeds of up to four gigabits per second. Of late, the Internet small computer interface (iSCSI) protocol is becoming increasingly popular as a SAN interconnect technology. From a host storage interface perspective, iSCSI tends to be less expensive. FC, on the other hand, provides more flexibility in terms of distance, flexible topologies, and the number of devices and servers that can be attached.

Hard Disk Drives

Despite their multitude of uses, all hard disk drives (HDDs) employ the same basic technology. One or more hard disks are attached to a spindle assembly, which is powered by a spindle motor that rotates the disks at a constant speed around a hub. The disks are the sites at which data are retrieved and stored.

Demand for HDDs is influenced by a number of factors, including improvements in computing price-to-performance ratios, the digitization of printed information, the increase in file sizes, growth in emerging economies, and expansion of this technology into consumer electronics equipment. HDD performance is often measured in terms of aerial density, which is the storage capacity per square inch on the recording surface of a disk.

Consolidation over the last few years has caused the disk drive industry to become more concentrated. Today, HDD manufacturers Western Digital Corp. and Seagate Technology dominate about 75% of the total market.

Storage capacity can vary widely, depending on the product offering and end market being served, and it has increased greatly since mid-2006. New technologies, like perpendicular magnetic recording, are responsible for increasing drive capacities. Technological innovation has also reduced the number of components used in making HDDs, which significantly lowers their cost and increases their reliability.

Flash Memory/Solid-State Drives

Other products receiving more attention today are devices based on flash memory technology—a type of nonvolatile memory in which the memory pattern is erased by very large arrays of bytes.

There are two main kinds of flash memory. The first is NAND, which is primarily used for storing large quantities of data. The second, NOR, offers faster read speeds and is more suitable for applications such as cellular phones. Because flash memory has been incorporated into a host of consumer-related products, it has broadened the storage industry's addressable market.

In January 2009, SanDisk Corp. announced the availability of a 240 GB solid-state drive (SSD) for PCs. Compared with conventional platter HDD technology, the SSD has no moving parts and consumes less power. As a result, SSDs allow laptop battery charges to last longer and the laptop battery's useful life to be extended (due to fewer charging cycles and the longer intervals between recharges).

Because SSDs are based on flash memory technology, they provide faster access times and generate less heat—both of which are seen as differentiating advantages. CFRA thinks that ongoing pricing declines have now made SSDs a serious threat to conventional HDDs.

Tape Products

Tape-based storage is another option for customers in need of information management solutions. This process involves reading data and then writing the data onto tape. Tape-based storage tends to be used for data that are less relevant to the ongoing operations of a business and need to be accessed infrequently.

Tape storage is sometimes combined with a disk-based backup system to provide an additional layer of protection and replication. The advantage to using tape is that it is typically less expensive and more energy efficient than disk storage. On the down side, tape's speed and functionality, while improving, are generally not as robust as those of similar disk-based products.

Operational Factors

The operations of a company in the technology hardware, storage & peripherals industry are influenced by a variety of factors. The following section details what CFRA thinks are some of the most important considerations for firms in this industry.

Production Requirements

Successful companies in the hardware/storage industry must make significant investments in components, equipment, people, and real estate. They may manufacture their products internally or by outsourcing, and they can operate in locations throughout the world, depending on the costs, customer requirements, and supply chain logistics. Asia has become a particularly attractive manufacturing location, with its growing economies, lower labor and materials costs, tax incentives, and well-educated workforce.

Given the complex nature of the space, companies must hire workers with highly specialized backgrounds and skill sets in order to develop state-of-the-art offerings and stay competitive. Company research teams are usually characterized by an abundance of engineers, many of whom possess PhDs. In addition, companies typically offer ongoing training to ensure that employees stay abreast of current marketplace trends.

Customer Base

Traditionally, many of the larger hardware/storage providers have focused their resources on the so-called enterprise market: large organizations, such as corporations and government agencies. Products for this market offer massive amounts of capacity, as well as state-of-the-art capabilities with respect to efficiency, reliability, and speed, and can cost as much as several hundred thousand dollars. More recently, the industry has enhanced its focus on the middle and lower tiers

of the market by presenting products that offer many of the same high-end features, but at a fraction of the price.

Competition

A variety of factors influences the competitive landscape of the technology hardware, storage & peripherals industry. From evolving technologies, to pricing pressures, to research and development (R&D), the sector is in a state of perpetual motion. For these reasons, size matters, and the industry's entry barriers are high.

◆ **Scale.** Despite inherent differences, the industry's product segments have many similarities in terms of competition. First, size matters. The leading companies are able to meet the changing needs of their customers, given the breadth of their product lines and devotion to investing in R&D. The biggest firms have the ability to initiate and/or weather price reductions because of their more efficient operating structures. These manufacturing efficiencies are attributable not only to economies of scale, but also to cost-reduction initiatives implemented after the bursting of the Internet bubble.

◆ **Barriers to entry.** The industry has high barriers to entry. The level of technical expertise required and the amount of money that must be allocated toward R&D make it exceedingly difficult for new entrants to gain traction in this market. In addition, established companies typically have experienced management teams that can develop successful business strategies and stave off upstart companies. Many existing companies have developed multiple patents in order to protect their intellectual property.

Pricing Trends

Pricing trends differ based on what area of the technology hardware, storage & peripherals industry a company is exposed to. However, pricing is typically biased to the downside in almost all cases. For instance, the price of disk storage systems decreased about 30% per year in the past, but this level can be higher depending on supply/demand imbalances, new product introductions, and individual company strategies.

During the market downturn in 2000 and 2001, price competition grew vicious in many parts of the space as demand evaporated with very little warning. Companies were forced to offer their products at drastic discounts in order to stimulate customer interest. This defensive strategy eroded profitability by pressuring gross margins. However, proactive companies were able to offset some of this shortfall by implementing major cost-reduction efforts and lowering corporate operating expenses. While the severity of price discounting has largely subsided, there are still pockets of the industry that are experiencing intense pricing battles.

In the past, makers of HDDs tended to experience more abrupt price swings than other areas of the storage market, in CFRA's estimation. We think this resulted from the difficulty in anticipating near-term demand and the limited lead times often associated with the production process. However, we note that consolidation has moderated annual price declines.

Product Cycles

The ability to determine the life cycle of a particular product is a key management consideration. If a product is allowed to stay in the marketplace for an excessive period, the company risks declining revenues and the ceding of market share to peers with more formidable offerings. At the same time, pulling a product too quickly in favor of an updated version may result in unnecessary expenses and the cannibalization of a company's wares.

Product cycle times can vary from just a few months to several years, depending on the level of competition, companies' emphasis on R&D, and consumer demand. Customers tend to watch these cycles closely; if they are interested in purchasing a new device, but expect an updated version to be released soon, they may decide to wait in order to take advantage of the newer offering.

Distribution and Alliances

Storage systems and components are sold through multiple outlets, including directly to original equipment manufacturers (OEMs) and through various partner and channel relationships. In most instances, partnerships create “win-win” opportunities for the affiliated companies. One example is the ongoing relationship between EMC and Dell. Their agreement involves joint product manufacturing, marketing, and collaboration on product design and technologies. EMC has been able to take advantage of Dell's world-renowned production capabilities and to expand its global reach by leveraging Dell's customer base. In turn, Dell has been able to build out its storage product portfolio by relying on EMC's broad experience and technical expertise.

Inventory

Inventory levels are an important consideration when determining product demand and the success of a company's sales strategies. There is considerable risk in shipping too many products based on the assumption that demand is likely to improve in the near term. If a company or one of its channel partners incorrectly forecasts demand trends, it may have to cut prices in order to stimulate purchases and to reduce product levels to avoid obsolescence. Conversely, keeping inventory levels too low can result in missed opportunities, should demand patterns exceed expectations.

KEY INDUSTRY RATIOS AND STATISTICS

◆ **IT spending.** This category concerns the amount of money allocated to initiatives related to information technology (IT) on a worldwide basis, over the course of the year. Projected and actual data are broken out by vertical market and individual product line and are reported by IDC, a research firm specializing in the IT and communications industries.

This statistic may give the best indication of demand for storage products, which fall under the IT spending umbrella. These data points also indicate the overall attitude of corporations toward spending on IT-related products and services; a rising forecast generally indicates greater business confidence, and vice versa.

◆ **Smartphone/PC/tablet shipment forecasts.** Reported on a quarterly basis by IDC, this metric measures the number of smartphones/PCs/tablets that manufacturers expect to ship on a worldwide basis during the year. IDC also provides projections by individual regions and for future periods. The combined shipment forecasts offer a good barometer as to the overall level of demand for IT products. It is particularly relevant to the hard disk drive (HDD) segment of the industry, since HDDs are installed inside PCs.

◆ **External disk storage systems revenue and market share data.** These statistics track the performance of the disk storage systems portion of the data storage market. The data are compiled by IDC and published on a quarterly basis. These data points describe how this subsector of the data storage market performed during the quarter and give an indication of the strength of underlying demand trends. In addition, the data show which companies were able to gain or lose market share.

◆ **Consumer confidence.** Consumer spending is an important factor for the computer industry on an indirect basis. First, consumer confidence is an important element in corporate profitability, which in turn drives business capital spending. In addition, as Internet connected devices in the home increases, businesses must invest more in their IT infrastructure to handle increasing demand for e-commerce transactions and other high-tech services.

A high level of consumer confidence generally signals that people feel good about the economy, their job prospects, and future earnings ability. High or rising confidence is usually accompanied by increased spending and borrowing—necessary ingredients for the purchase of relatively big-ticket items like PCs. Conversely, when consumer confidence is low, people are more likely to postpone nonessential outlays.

The Conference Board conducts the most widely followed consumer confidence survey. It polls 5,000 representative households each month to gauge consumer sentiment. This measure of consumer attitudes is expressed as an index, with 1985 as a base year (1985=100).

◆ **Real growth in gross domestic product.** Growth domestic product (GDP), the broadest measure of aggregate economic activity, is the market value of all goods and services produced by labor and capital in the US; it is reported quarterly by the US Department of Commerce (DOC). Growth in the economy is measured by changes in inflation-adjusted (or real) GDP.

◆ **Currency exchange rates.** The multinational nature of the technology hardware, storage & peripherals industry means that the value of the dollar, compared with that of other currencies, is of great importance. Companies like IBM, Dell Inc., and HP generate a significant proportion of

their sales and profits from outside the US; thus, they are affected by changes in the dollar's value versus other currencies.

For US companies in the technology hardware, storage & peripherals industry that have a significant operating presence in international markets, currency swings also affect the expense side of their ledgers. The increasing level of global exposure often causes wide variations in these companies' reported results. To limit the financial risk associated with currency swings, companies are increasing their use of hedging techniques, which have helped them limit foreign currency impacts on financial results. Still, it is important to understand both the net impact of currency swings on reported financial statements and the true level of business activity on a constant currency basis.

HOW TO ANALYZE A COMPANY IN THIS INDUSTRY

Rapid technological changes make it imperative for analysts and investors to go beyond traditional quantitative methods in assessing the outlook of a company in the technology hardware, storage & peripherals industry. To be sure, financial statement analysis is a critical ingredient in determining the future prospects of any company. However, qualitative judgments must also be made about technology, competition, business and marketing strategies, and the credibility and potential of a company's management team, as well as prospects for the industry as a whole.

Analysis of the quantitative and qualitative aspects of a company in the technology hardware, storage & peripherals industry should be considered within the context of the omnipresent threats and opportunities posed by new technology. Again, rapid changes are key characteristics of the industry, and how well a company manages this variable can determine whether it emerges as an industry leader, becomes a second- or third-tier player, or fails to make the grade.

The history of the computer industry contains vivid examples of companies with dominant franchises that failed to keep up with technological shifts away from their core markets. Apple Inc., Digital Equipment Corp. (DEC), and International Business Machines Corp. (IBM) all dominated key segments of the technology hardware, storage & peripherals industry, only to see their positions deteriorate as the market shifted toward faster, cheaper, and more functional products. Their declining positions eventually showed up on the companies' financial statements, but an investor attuned to industry dynamics would have been alerted by earlier clues.

Knowledge of general economic conditions affecting business in general and the computer industry in particular is essential in determining conditions within the data storage industry. A key indicator within the overall economic picture is the level of spending by enterprise customers, which determines the near-term flow of dollars to the storage industry. To assess an individual company's situation within this environment, it is important to consider both qualitative and quantitative factors affecting its condition, as detailed below.

Comparative Analysis Is Critical

An investor must identify a company's competitive advantages—and its disadvantages. What are the company's key products and markets, and how does it differentiate itself from its peers? How does its current strategy compare with its plans for the future, and how do they both compare with the strategies of competitors? Has management been able to articulate strategy, and does its past performance indicate it will be successful in executing its plans? Does the company have an edge over its competitors? If so, is it likely to maintain that edge?

An investor needs to understand how each company has positioned itself concerning these factors and whether the strategy makes sense, given the trend seen for overall market demand.

Peer Comparisons

An important consideration when looking at relative valuation measures—such as price-to-earnings (P/E), price-to-sales (P/S), or any other metric that involves comparing a company with its peers—it is important to find the best like-for-like comparison. In order to ascribe a multiple based on relative valuation to a particular vendor in the storage group, it is important to consider the makeup of its revenue and earnings, and decide which of its peers compare most closely.

Barring major structural or fundamental differences, companies with the same product focus and addressing common target markets tend to be valued similarly.

Growth Is Relative

How does a company's financial performance compare with others in its peer group? Again, while absolute numbers are an important part of the financial assessment of any company, comparing performance and financial ratios with those of its peers is critical. For example, it is clearly a cause for concern if a company achieved revenue growth of 5% in a year in which the average industry growth rate was 10%. Why did the company underperform? Similarly, if a company's growth outpaces the average, investors will want to uncover the reasons. Is that above-average growth rate sustainable?

The next step is to consider the growth rate for the particular industry segments in which the company participates. The outlook for mainframe computers, for example, differs from the higher growth prospects for PCs and servers.

Finally, the financial results of a company should always be considered within the context of the markets it serves. Does the company primarily serve the consumer or corporate market for PCs? In which geographic areas does it participate? What is the company's growth relative to its competition in these geographic areas and the market's overall growth potential? A company's geographic footprint can affect its effective tax rate, as well as revenue potential and production cost levels; tax rates typically head lower as more operations occur outside the US.

Quantitative Analysis: Looking at Financial Statements

Analyzing a company's principal financial documents—the income statement and the balance sheet—provides an important base for assessing its overall performance.

An investor can gauge the fundamental strength of a storage vendor by identifying the markets in which it competes and understanding their dynamics. What are the overall growth expectations for those markets? It is also important to determine the level of competition in a company's particular market segments. Who are its major competitors? Are there many small competitors or a few large firms wielding significant resources? How does the company stack up against them, and what are its particular advantages? One possible advantage is size; another might be the overall breadth of its product line.

The ability to adapt quickly to technological change is another key factor. As faster and more efficient products pique the interest of customers, it is critical that a company respond proactively to deliver those products in a timely manner. Companies that are unable to do so risk losing market share and may face additional expenses related to obsolete inventory. Somewhat related to technological change is the effect of regulatory issues placed on the business needs of the customer base. More specifically, absent a standard or technical specification, vendors within the industry can often differentiate themselves from competitors by their approach to satisfying storage-related compliance issues.

A further qualitative point to research is management ability. Clues about a company's management team can be obtained by looking at its history. What is its record? How long have the high-ranking managers been with the company? If they recently took control, what have they done previously? It is also preferable for managers to own stock or options in the company. This helps to ensure that they have the incentive to do what is best for the shareholders—that is, to create shareholder value.

Key Elements on the Income Statement

A company's income statement shows its operating results over a specific period and thus is a key part of any analytical endeavor. An investor should determine the components and trends of a company's profits, and then compare these results with those of its competitors.

◆ **Sales trends.** Beginning at the top of the income statement, investors should look at short-term and long-term growth trends in revenues. Ideally, sales in the current period should show growth from the year-earlier period. Moreover, if the company participates in a high-growth industry, or if it is in the early stage of a new product cycle, sequential growth (from one quarter to the next) would be expected, though seasonal factors should also be considered. In addition, sales growth should be compared with that of direct competitors and against the overall industry rate. Revenues derived by data storage vendors tend to follow a seasonal pattern, in which the last quarter of the calendar year is often the strongest. CFRA thinks this is largely the result of corporate information technology (IT) departments accelerating their level of spending late in the year in order to use up allotted funds—a process often referred to as a budget flush.

◆ **Gross profit margin.** This is arguably one of the most important profitability measures to consider in assessing a company in the technology hardware, storage & peripherals industry. Gross margins (the percentage of sales remaining after subtracting the cost of goods sold or costs such as materials, labor, and overhead) can be affected by a number of variables, including sales mix, sales volumes, pricing pressures, and component costs.

Significant gross margin pressure has been the norm in the technology hardware, storage & peripherals industry in recent years, as pricing competition has intensified. Successful companies have been able to counter margin pressure somewhat by adding a higher-margin mix of products, improving their manufacturing efficiency, and maintaining lean inventory levels.

A drop in gross margin may reveal that a vendor has changed its bidding policies to use price as a competitive weapon to win contracts. Although price cuts reduce a contract's profitability, they often increase the company's overall business volume.

◆ **Expense line items.** These include selling, general, and administrative (SG&A) costs, and research and development (R&D) costs, which should be evaluated relative to industry norms. Ideally, expenses should increase more slowly than sales. However, technology companies with high-growth prospects sometimes must expand their workforce rapidly to support sales growth and/or new product development. In such years, their expenses can rise faster than sales.

◆ **Net profit margin.** This is the bottom line and is calculated as net income divided by total sales. Along with operating performance, it reflects a company's taxes and its nonoperating income and expense items, such as interest income and interest expense. As many companies have reduced debt levels and improved operating efficiencies, net profit margins have improved in recent periods.

Balance Sheet Provides Clues to Future Results

How strong is a company's financial position? The balance sheet offers a snapshot of the company's financial position at a specific moment in time. Some factors to study include the ratio of long-term debt-to-capital, current assets, the current ratio, inventories, and accounts receivable.

◆ **Ratio of long-term debt-to-capital.** Long-term debt as a percentage of total capital varies widely among computer makers. Low debt levels give a company the financial flexibility to acquire emerging technologies or other technology companies, and minimize interest expense.

◆ **Cash and investments.** This metric indicates a company's ability to meet near-term debt obligations, make acquisitions, repurchase stock, and/or pay dividends. This line item has become more of a focal point in recent years, as many data storage vendors have looked to expand their product lines by making strategic acquisitions.

◆ **Current assets.** Also important in the analysis of a technology company is a careful examination of current assets. Is the company headed for a potential cash crunch? The level of cash and marketable securities is usually a good starting point for assessing a company's short-term liquidity. Because the technology hardware, storage & peripherals industry is subject to wide swings in profitability, most companies require a reasonable level of cash and cash equivalents for emergency liquidity and growth needs.

◆ **Current ratio.** Another check on liquidity is the current ratio (the ratio of current assets to current liabilities), also called the working capital ratio. A healthy working capital ratio helps to ensure that the company can adequately meet its current liabilities; this ratio should be greater than one. Any meaningful degradation in the current ratio from previous reporting periods should be closely examined.

◆ **Inventories.** Given the technology hardware, storage & peripherals industry's tendencies toward rapid price declines and inventory obsolescence, the level and health of a company's inventory position must be constantly monitored. When inventory levels increase faster than the rate of sales growth, it can signal either potential opportunity or potential trouble. For example, it may be that the company is gearing up for heightened business activity, such as in the early stages of a new product cycle. Alternatively, it could be a red flag signaling that existing products are not selling well.

How fast is the company turning over its inventory? This is a critical question companies are increasingly asking themselves on two levels: as a clue to manufacturing efficiency and as a tool for cash-management optimization. Product sitting on a shelf in a warehouse ties up assets that could be better deployed (*e.g.*, put toward investments in future growth). A key measure to watch is the inventory turnover ratio (the annualized cost of goods sold divided by the value of average inventory), which measures the average speed at which inventories move to sales. Any meaningful change in inventories or turnover rates should be investigated.

◆ **Deferred revenue.** This metric encompasses revenue that has been received by the company for work that it has not yet performed. Such revenue is classified as a liability on the balance sheet until the product or service is provided to the customer. CFRA thinks that this category is useful to investors, as it offers a peek into a company's revenue potential.

◆ **Accounts receivable.** An analysis of accounts receivable can provide insight into how well a company's products are selling. A rise in the level of accounts receivable may indicate that a significant portion of sales was made in the last few weeks of the quarter. Although many technology companies experience this type of sales trend (sometimes described as a "hockey stick"), it could signal that price concessions or generous payment terms had to be extended to pump up sales. However, as the technology hardware, storage & peripherals industry becomes more global, accounts receivable could generally trend higher as a matter of logistics. One way to track accounts receivable is by measuring the days' sales outstanding. Simply divide accounts receivable by sales for a given quarter and multiply by 91.

Free Cash Flow

When valuing a data storage firm, an important measure is free cash flow—the amount of excess cash the company has available after paying off its obligations. The investor should determine how the company expects to use its free cash flow. Possible strategies include repurchasing shares of the company's common stock, paying dividends to shareholders, reinvesting the cash in the business, or pursuing acquisitions. Generally, a company in a growth stage will pump its cash back into the business to fuel further growth. Mature companies that do not earn a high enough return on their invested capital may elect to pay out the cash to their shareholders through dividends or share repurchases.

Performance and Valuation Metrics to Consider

Drawing from both the income statement and the balance sheet, two important measures of a company's overall financial performance are return on assets (ROA) and return on equity (ROE). These measures, along with growth projections, provide key indicators for a valuation analysis.

In evaluating the relative attractiveness of a company's current stock price, performance metrics and growth rates should be considered alongside price-related valuation ratios such as price/earnings, price/sales, and price/cash flow. The investor should compare valuation ratios with the company's own historical ratios and with those of peer companies and the overall stock market.

◆ **ROA and ROE.** Any financial statement analysis would be incomplete without some discussion of return on investment, of which the two most popular measures are return on assets (ROA) and return on equity (ROE). ROA (net income divided by average total assets) measures a company's operating efficiency or the return earned on assets under management's discretion. ROE (net income divided by average total shareholders' equity) measures the return earned on shareholders' capital. Both ratios measure management's ability to earn a reasonable profit on the assets and capital entrusted to them.

IBM struggled with these metrics in the early 1990s as customers transitioned away from the old-style mainframe platform to the more popular PC, and the company posted losses through 1993. Since then, newer IBM products and a strategy that emphasized higher growth opportunities in software and services have generated steady improvement in the company's ROA and ROE measures.

◆ **P/E and PEG.** The term price-to-earnings (P/E) refers to the price-to-earnings ratio of a stock. To arrive at this figure, simply take the stock price and divide by the current year's projected earnings. For a forward projection, one can use the forecasted earnings for the next year. A variation of this ratio, which can be used to weigh the strength of earnings growth as part of valuation assessments for a given company relative to its peers, is referred to as the price/earnings to growth (PEG) ratio, or the P/E divided by the company's projected average five-year earnings growth rate.

In CFRA's view, when the economic environment is relatively stable or on an uptrend, data storage companies are valued based on their profitability. In this environment, the most common valuation metrics used are P/E ratio and multiples of operating profits. Although the data storage industry is no longer viewed as a fast-growing segment, we project that it will outpace the rest of the IT industry and the overall market. Thus, we estimate that the average P/E ratio for the data storage industry should be above that of the overall market, reflecting its higher growth potential.

◆ **P/S ratio.** The price-to-sales (P/S) ratio is derived by dividing the current share price of the company by its projected revenues for the current year on a per-share basis. This ratio is used in

times when earnings are not available (*e.g.*, the company is operating at a loss), or when earnings forecasts are in question.

◆ **P/CF ratio.** To calculate price-to-cash flow (P/CF) ratio, take the company's stock price, and divide it by the sum of the current year's forecasted cash flow. The most commonly used proxy for a company's cash flow is earnings before interest, taxes, and depreciation and amortization (EBITDA). The real-world use of this ratio is generally derived using the forecast of EBITDA for the next year. P/CF is typically used in cases where a company's earnings are penalized by high capital intensity.

GLOSSARY

Aerial density—A measure of storage capacity per square inch on the recording surface of a disk.

Architecture—The overall design of the computer; it governs the interrelations between the operating system and the physical hardware. Intel-compatible computers all have the same architecture, usually referred to as Standard Intel Architecture. Apple Macintosh computers, IBM mainframes, and Sun servers running UNIX each have different architectures. “Open architecture” allows other manufacturers to design compatible devices; a closed architecture, in contrast, has a proprietary design.

Broadband—A class of Internet connections, including cable modems, digital subscriber lines, satellite systems, and Wi-Fi, that offer higher capacity and faster data transfer speeds than those available through a modem using ordinary telephone lines.

Channel—The group of distributors and resellers used by an original equipment manufacturer (OEM) to sell its product, as distinct from sales made directly to end users. Channel partners (*i.e.*, retailers or other marketers) may buy from the OEM directly or from a distributor.

Cloud computing—Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the electricity grid.

Database—A computer-based collection of information or data files, organized and presented to serve a specific purpose.

Disk drive—An internal or peripheral device on which data can be stored and retrieved; used in all sizes of computers.

Fibre channel—A networking technology used to transmit data between computer devices. It is the primary connection type used in a storage area network (SAN).

Flash memory—A type of nonvolatile memory in which the memory pattern is erased by very large arrays of bytes.

Form factor—The physical form in which a computer’s components are packaged. In the PC market, laptops have recently overtaken desktop computers as the predominant form factor, and mini notebooks (also known as netbook computers) are gaining popularity. Tablet computers, which are positioned between traditional laptops and the smaller, less robust netbooks, are also seeing new interest.

GB—One gigabyte, or 1,000 megabytes; a unit by which computer memory and data transfer speeds are measured.

Hard disk drive (HDD)—A device that reads and writes data on a hard disk. It is used for information storage and retrieval.

Hardware—The physical components of a computer system, as opposed to the software that makes the system or its applications run.

Internet—A public network connecting many computer networks and based on a common addressing and communications system called TCP/IP (transmission control protocol/Internet Protocol).

Linux—A variant of the UNIX operating system that is “open source,” meaning that users can freely modify it. Linux is increasingly popular for running corporate servers, but is a lesser force in desktop computing. (See *UNIX*.)

Local area network (LAN)—Interconnected workstations sharing the resources of a single processor or server within relatively close proximity.

Mainframe—A large, expensive computer capable of supporting hundreds, or even thousands, of users simultaneously.

Microprocessor—A central processing unit, or CPU, consisting of one or more chips that perform the basic arithmetic, logic, and control functions that a computer needs to process data.

Network—A collection of hardware, communications facilities, and software that gives computers access to shared resources (*e.g.*, databases) and peripheral devices (*e.g.*, printers and modems).

Network-attached storage (NAS)—Storage attached directly to the network through a high-end server.

Operating system—Software that controls the inner workings of the computer. It performs basic housekeeping chores such as recognizing input from the keyboard, keeping track of files and directories, and controlling peripheral devices. Most PCs run on the same operating system, Microsoft Windows, but servers use a variety of different operating systems, including UNIX, Linux, and others, in addition to Windows.

Original equipment manufacturer (OEM)—In the computer industry, this term usually refers to a vendor that assembles computer systems with components made by other suppliers.

Peripherals—External devices attached to a computer; examples include printers, disk drives, display monitors, and keyboards.

RAM—Random access memory; an electronic storage area used by a computer to hold the information it is currently working on. Data stored in RAM is lost when the flow of electricity stops. RAM can be dynamic (DRAM), which must be refreshed periodically, or static (SRAM), which does not need refreshing and is faster (but larger and more expensive) than DRAM.

Server—A computer or a device on a network that manages network resources. For example, a file server is a computer and a storage device dedicated to storing files; any user on the network can store files on the server. A print server is a computer that manages one or more printers.

Software—Computer programs that either direct the operation of a computer (system software) or accomplish user tasks (application software).

Solid-state drive (SSD)—A storage device that stores persistent data using integrated circuits (ICs) rather than magnetic or optical media.

Storage area network (SAN)—A dedicated network providing storage and backup solutions. The network establishes a connection between storage devices and the back end of a server.

Switches—Network devices that connect and filter pieces of a message (or “packets”) between LAN segments.

UNIX—An operating system developed by AT&T’s Bell Laboratories that has multiuser, multitasking, and networking capabilities. (See *Linux*.)

Virtualization—The creation of a virtual (rather than actual) version of something, such as an operating system, a server, a storage device, or network resources.

Wi-Fi—Short for wireless fidelity; refers to a set of wireless communications standards that provide broadband networking connections over short distances using unregulated radio waves.

Workstation—A single-user system for engineers and other technical professionals; it features a high-performance microprocessor and graphics capabilities, significant storage capacity, and networking facilities.

INDUSTRY REFERENCES

PERIODICALS

Computerworld

<http://www.computerworld.com>
Computer hardware and software news.

CRN

<http://www.crn.com>
Computer hardware and software industry news.

InformationWeek

<http://www.informationweek.com>
News and features on the computer hardware and software industries.

InfoWorld

<http://www.infoworld.com>
Covers computer hardware and software.

Investor's Business Daily

<http://www.investors.com>
News on the financial markets with an emphasis on technology.

PC Mag Asia

<http://www.sea.pcmag.com>
Covers news in the PC industry.

SearchStorage

<http://searchstorage.techtarget.com>
Storage-specific technical advice for IT professionals, buyers, and marketers via *Storage* magazine, websites, and Storage Decisions conferences and seminars.

MARKET RESEARCH FIRMS

Forrester Research, Inc.

<http://go.forrester.com>
Leading market research firm with expertise in technology; also gives advice about technology's impact on business.

Gartner, Inc.

<http://www.gartner.com>
Provides worldwide market coverage on various sectors of information technology, including semiconductors, computer systems and peripherals, communications, document management, software, and services.

IDC Research, Inc.

<http://www.idc.com>
Leading provider of information technology data, analysis, and consulting.

ONLINE RESOURCES

CNET News

<http://www.cnet.com/news>
Daily news coverage, product reviews, and software downloads.

EDGAR Database

<http://www.sec.gov/edgar/searchedgar/webusers.htm>
Site maintained by the Securities and Exchange Commission, which provides access to corporate documents, such as 10-Ks and 10-Qs.

Network Computing

<http://www.networkcomputing.com>
Part of UBM TechWeb, a provider of technology media and business information, this online magazine addresses the major technological issues IT managers face.

GOVERNMENT AGENCIES

US Bureau of Economic Analysis (BEA)

<http://www.bea.gov>
Agency within the US Department of Commerce; its mandate is to collect economic data.

US Department of Commerce (DOC)

<http://www.commerce.gov>
Cabinet-level department responsible for a variety of government agencies that monitor and regulate US commerce.

COMPARATIVE COMPANY ANALYSIS

Operating Revenues

Ticker	Company	Yr. End	Million \$							CAGR (%)			Index Basis (2005 = 100)									
			2015	2014	2013	2012	2011	2010	2005	10-Yr.	5-Yr.	1-Yr.	2015	2014	2013	2012	2011					
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																						
DDD	† 3D SYSTEMS CORP	DEC	666.2	653.7	513.4	353.6	A	230.4	A	159.9	A	139.7	16.9	33.0	1.9	477	468	368	253	165		
AAPL	□ APPLE INC	SEP	233,715.0	182,795.0	A	170,910.0	A	156,508.0	A	108,249.0		65,225.0	13,931.0	32.6	29.1	27.9	1,678	1,312	1,227	1,123	777	
CRAY	\$ CRAY INC	DEC	724.7	561.6	525.7	421.1	A	236.0		319.4		201.1	13.7	17.8	29.0	360	279	262	209	117		
DBD	† DIEBOLD NIXDORF INC	DEC	2,419.3	A,C	3,051.1	2,857.5		2,991.7		2,835.8		2,823.8	2,587.0	A,C	(0.7)	(3.0)	(20.7)	94	118	110	116	110
EFII	\$ ELECTRONICS FOR IMAGING INC	DEC	882.5	A	790.4	727.7		652.1		591.6		504.0	468.5	A	6.5	11.9	11.7	188	169	155	139	126
HPE	□ HEWLETT PACKARD ENTERPRISE	OCT	52,107.0	55,123.0	57,371.0	NA		NA		NA		NA	NA	NA	(5.5)	**	**	**	**	NA		
HPQ	□ HP INC	OCT	103,355.0	111,454.0	A	112,298.0	A	120,357.0		127,245.0		126,033.0	86,696.0	1.8	(3.9)	(7.3)	119	129	130	139	147	
NCR	† NCR CORP	DEC	6,373.0	6,591.0	A	6,123.0	A	5,730.0	D	5,443.0	A,C	4,819.0	6,028.0	0.6	5.7	(3.3)	106	109	102	95	90	
NTAP	□ NETAPP INC	# APR	5,546.0	A	6,122.7	6,325.1		6,332.4		6,233.2	A	5,122.6	2,066.5	10.4	1.6	(9.4)	268	296	306	306	302	
STX	□ SEAGATE TECHNOLOGY PLC	JUN	13,739.0	13,724.0	14,351.0	14,939.0	A	10,971.0		11,395.0		7,553.0	6.2	3.8	0.1	182	182	190	198	145		
SMCI	\$ SUPER MICRO COMPUTER INC	JUN	1,991.2	1,467.2	1,162.6	1,013.9		942.6		721.4		211.8	25.1	22.5	35.7	940	693	549	479	445		
WDC	□ WESTERN DIGITAL CORP	JUN	14,572.0	15,130.0	15,351.0	12,478.0	A	9,526.0		9,850.0		3,638.8	14.9	8.1	(3.7)	400	416	422	343	262		
XRX	□ XEROX CORP	DEC	18,161.0	19,540.0	D	21,435.0	D	22,390.0		22,626.0		21,633.0	A	15,701.0	1.5	(3.4)	(7.1)	116	124	137	143	144

Note: Data as originally reported. CAGR-Compound annual growth rate. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

**Not calculated; data for base year or end year not available. A - This year's data reflect an acquisition or merger. B - This year's data reflect a major merger resulting in the formation of a new company. C - This year's data reflect an accounting change. D - Data exclude discontinued operations. E - Includes excise taxes. F - Includes other (nonoperating) income. G - Includes sale of leased depts. H - Some or all data are not available, due to a fiscal year change.

Net Income

Ticker	Company	Yr. End	Million \$							CAGR (%)			Index Basis (2005 = 100)				
			2015	2014	2013	2012	2011	2010	2005	10-Yr.	5-Yr.	1-Yr.	2015	2014	2013	2012	2011
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																	
DDD	† 3D SYSTEMS CORP	DEC	(655.5)	11.6	44.1	38.9	35.4	19.6	10.1	NM	NM	NM	NM	115	437	386	351
AAPL	□ APPLE INC	SEP	53,394.0	39,510.0	37,037.0	41,733.0	25,922.0	14,013.0	1,335.0	44.6	30.7	35.1	4,000	2,960	2,774	3,126	1,942
CRAY	\$ CRAY INC	DEC	27.5	62.3	32.2	161.2	14.3	15.1	(64.3)	NM	12.8	(55.8)	NM	NM	NM	NM	NM
DBD	† DIEBOLD NIXDORF INC	DEC	57.8	114.4	(181.6)	81.6	144.3	(20.5)	82.9	(3.5)	NM	(49.5)	70	138	(219)	98	174
EFII	§ ELECTRONICS FOR IMAGING INC	DEC	33.5	33.7	109.1	83.3	27.5	7.5	(4.1)	NM	35.0	(0.5)	NM	NM	NM	NM	NM
HPE	□ HEWLETT PACKARD ENTERPRISE	OCT	2,461.0	1,648.0	2,051.0	NA	NA	NA	NA	NA	NA	49.3	**	**	**	**	NA
HPQ	□ HP INC	OCT	4,554.0	5,013.0	5,113.0	(12,650.0)	7,074.0	8,761.0	2,398.0	6.6	(12.3)	(9.2)	190	209	213	(528)	295
NCR	† NCR CORP	DEC	(154.0)	181.0	452.0	140.0	50.0	111.0	529.0	NM	NM	NM	(29)	34	85	26	9
NTAP	□ NETAPP INC	# APR	229.0	559.9	637.5	505.3	605.4	673.1	266.5	(1.5)	(19.4)	(59.1)	86	210	239	190	227
STX	□ SEAGATE TECHNOLOGY PLC	JUN	1,742.0	1,570.0	1,838.0	2,862.0	511.0	1,609.0	707.0	9.4	1.6	11.0	246	222	260	405	72
SMCI	\$ SUPER MICRO COMPUTER INC	JUN	101.9	54.2	21.3	29.9	40.2	26.9	7.1	30.5	30.5	88.1	1,437	764	300	421	567
WDC	□ WESTERN DIGITAL CORP	JUN	1,465.0	1,617.0	980.0	1,612.0	726.0	1,382.0	198.4	22.1	1.2	(9.4)	738	815	494	813	366
XRX	□ XEROX CORP	DEC	552.0	1,084.0	1,185.0	1,195.0	1,295.0	606.0	933.0	(5.1)	(1.8)	(49.1)	59	116	127	128	139

Note: Data as originally reported. CAGR-Compound annual growth rate. □Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600.

#Of the following calendar year. **Not calculated; data for base year or end year not available.

Ticker	Company	Yr. End	Return on Revenues (%)					Return on Assets (%)					Return on Equity (%)				
			2015	2014	2013	2012	2011	2015	2014	2013	2012	2011	2015	2014	2013	2012	2011
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																	
DDD	† 3D SYSTEMS CORP	DEC	NM	1.8	8.6	11.0	15.4	NM	0.9	5.0	6.8	10.5	NM	1.0	6.2	10.6	18.3
AAPL	▯ APPLE INC	SEP	22.8	21.6	21.7	26.7	23.9	20.4	18.0	19.3	28.5	27.1	46.2	33.6	30.6	42.8	41.7
CRAY	§ CRAY INC	DEC	3.8	11.1	6.1	38.3	6.1	4.1	9.9	5.8	40.6	5.3	5.8	15.0	9.0	63.6	9.2
DBD	† DIEBOLD NIXDORF INC	DEC	2.4	3.8	NM	2.7	5.1	2.5	5.1	NM	3.2	5.7	12.2	20.3	NM	10.0	16.1
EFII	§ ELECTRONICS FOR IMAGING INC	DEC	3.8	4.3	15.0	12.8	4.6	2.4	2.9	10.4	9.2	3.8	4.2	4.3	15.4	13.7	4.9
HPE	▯ HEWLETT PACKARD ENTERPRISE	OCT	4.7	3.0	3.6	NA	NA	3.4	2.5	NA	NA	NA	7.0	4.4	NA	NA	NA
HPQ	▯ HP INC	OCT	4.4	4.5	4.6	NM	5.6	4.3	4.8	4.8	NM	5.6	16.7	18.6	20.6	NM	17.9
NCR	† NCR CORP	DEC	NM	2.7	7.4	2.4	0.9	NM	2.2	6.2	2.3	1.0	NM	9.9	30.0	13.7	5.9
NTAP	▯ NETAPP INC	# APR	4.1	9.1	10.1	8.0	9.7	2.4	6.0	6.2	4.9	6.7	7.3	15.6	15.0	11.2	15.1
STX	▯ SEAGATE TECHNOLOGY PLC	JUN	12.7	11.4	12.8	19.2	4.7	18.0	16.8	19.0	29.6	5.8	59.6	49.6	52.6	96.0	19.7
SMCI	§ SUPER MICRO COMPUTER INC	JUN	5.1	3.7	1.8	2.9	4.3	10.8	7.6	3.5	5.7	9.6	18.7	12.9	6.0	9.5	15.7
WDC	▯ WESTERN DIGITAL CORP	JUN	10.1	10.7	6.4	12.9	7.6	9.6	10.9	6.9	14.4	9.4	16.2	19.3	12.6	24.5	14.2
XRX	▯ XEROX CORP	DEC	3.0	5.5	5.5	5.3	5.7	2.0	3.7	3.9	3.9	4.2	5.4	9.2	9.7	10.0	10.6

Note: Data as originally reported. []Company included in the S&P 500. †Company included in the S&P MidCap 400. \$Company included in the S&P SmallCap 600. #Of the following calendar year.

Ticker	Company	Yr. End	Current Ratio					Debt / Capital Ratio (%)					Debt as a % of Net Working Capital				
			2015	2014	2013	2012	2011	2015	2014	2013	2012	2011	2015	2014	2013	2012	2011
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																	
DDD	† 3D SYSTEMS CORP	DEC	3.0	3.9	4.8	3.8	4.4	1.2	0.7	1.9	14.9	35.3	2.9	2.1	4.5	41.4	68.6
AAPL	□ APPLE INC	SEP	1.1	1.1	1.7	1.5	1.6	27.2	18.0	10.8	0.0	0.0	609.8	570.3	57.2	0.0	0.0
CRAY	\$ CRAY INC	DEC	3.5	3.5	3.0	3.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DBD	† DIEBOLD NIXDORF INC	DEC	1.7	1.6	1.7	2.2	2.1	59.7	47.1	44.2	42.2	41.4	89.1	76.4	72.6	63.3	66.7
EFII	\$ ELECTRONICS FOR IMAGING INC	DEC	3.4	4.5	3.0	1.7	2.9	26.9	27.3	1.5	0.0	0.0	52.7	43.4	2.9	0.0	0.0
HPE	□ HEWLETT PACKARD ENTERPRISE	OCT	1.4	1.1	1.2	NA	NA	30.3	1.3	1.5	NA	NA	167.4	21.4	17.8	NA	NA
HPQ	□ HP INC	OCT	1.2	1.1	1.1	1.1	1.0	43.7	36.5	35.7	46.2	34.0	227.0	250.2	342.9	548.7	NM
NCR	† NCR CORP	DEC	1.4	1.5	2.3	2.0	1.6	67.5	64.8	65.1	60.0	51.6	421.7	341.1	135.1	113.6	89.7
NTAP	□ NETAPP INC	# APR	1.8	2.5	2.4	2.2	1.9	34.1	30.3	20.8	17.4	0.0	53.5	36.6	26.4	21.7	0.0
STX	□ SEAGATE TECHNOLOGY PLC	JUN	2.4	2.4	2.1	1.9	1.9	57.9	58.0	44.1	45.0	54.5	128.8	116.0	99.0	98.2	99.7
SMCI	\$ SUPER MICRO COMPUTER INC	JUN	2.0	2.1	2.2	2.2	2.6	0.2	0.8	1.7	5.4	8.8	0.3	1.2	2.3	7.4	12.1
WDC	□ WESTERN DIGITAL CORP	JUN	2.6	2.3	1.9	1.8	2.5	19.0	20.7	17.9	20.3	2.7	40.9	47.4	47.6	62.9	4.5
XRX	□ XEROX CORP	DEC	1.3	1.5	1.5	1.4	1.2	40.2	36.5	35.3	38.6	36.7	446.0	225.7	244.4	315.2	463.0

Note: Data as originally reported. []Company included in the S&P 500. †Company included in the S&P MidCap 400. \$Company included in the S&P SmallCap 600. #Of the following calendar year.

Ticker	Company	Yr. End	Price / Earnings Ratio (High-Low)					Dividend Payout Ratio (%)					Dividend Yield (High-Low, %)				
			2015	2014	2013	2012	2011	2015	2014	2013	2012	2011	2015	2014	2013	2012	2011
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																	
DDD	† 3D SYSTEMS CORP	DEC	NM- NM	NM- NM	NM- 62	74- 20	41- 18	NM	0	0	0	0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0
AAPL	□ APPLE INC	SEP	14- 10	18- 11	14- 10	16- 9	15- 11	21	28	28	6	0	2.2- 1.5	2.6- 1.5	3.0- 2.0	0.6- 0.4	0.0- 0.0
CRAY	§ CRAY INC	DEC	51- 26	26- 15	34- 18	4- 1	20- 12	0	0	0	0	0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0
DBD	† DIEBOLD NIXDORF INC	DEC	44- 33	23- 18	NM- NM	33- 21	17- 11	129	65	NM	88	50	3.9- 3.0	3.6- 2.8	4.2- 3.2	4.1- 2.7	4.5- 3.0
EFII	§ ELECTRONICS FOR IMAGING INC	DEC	70- 50	66- 51	17- 8	11- 7	32- 22	0	0	0	0	0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0
HPE	□ HEWLETT PACKARD ENTERPRISE	OCT	14- 10	NA- NA	NA- NA	NA- NA	NA- NA	0	NA	NA	NA	NA	0.0- 0.0	NA- NA	NA- NA	NA- NA	NA- NA
HPQ	□ HP INC	OCT	16- 5	15- 10	11- 6	NM- NM	15- 6	27	23	21	NM	12	5.9- 1.6	2.2- 1.5	3.8- 1.9	4.4- 1.7	1.9- 0.8
NCR	† NCR CORP	DEC	NM- NM	35- 21	15- 9	30- 19	66- 48	NM	0	0	0	0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0
NTAP	□ NETAPP INC	# APR	54- 32	26- 19	24- 17	33- 19	37- 20	92	37	32	0	0	2.9- 1.7	2.0- 1.4	1.9- 1.3	0.0- 0.0	0.0- 0.0
STX	□ SEAGATE TECHNOLOGY PLC	JUN	12- 6	15- 10	11- 6	5- 2	16- 8	38	36	28	13	16	6.3- 3.1	3.5- 2.4	4.6- 2.5	5.3- 2.4	2.0- 1.0
SMCI	§ SUPER MICRO COMPUTER INC	JUN	19- 10	30- 13	34- 18	26- 11	19- 11	0	0	0	0	0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0	0.0- 0.0
WDC	□ WESTERN DIGITAL CORP	JUN	18- 9	17- 12	21- 10	7- 4	13- 7	29	18	25	0	0	3.1- 1.6	1.5- 1.1	2.4- 1.2	0.0- 0.0	0.0- 0.0
XRX	□ XEROX CORP	DEC	28- 18	16- 11	13- 7	10- 7	13- 7	56	27	24	19	18	3.1- 2.0	2.4- 1.7	3.3- 1.9	2.8- 1.9	2.6- 1.4

Note: Data as originally reported. □ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Ticker	Company	Yr. End	Earnings per Share (\$)					Tangible Book Value per Share (\$)					Share Price (High-Low, \$)									
			2015	2014	2013	2012	2011	2015	2014	2013	2012	2011	2015	2014	2013	2012	2011					
TECHNOLOGY HARDWARE, STORAGE & PERIPHERALS																						
DDD	† 3D SYSTEMS CORP	DEC	(5.85)	0.11	0.45	0.48	0.47	2.77	4.05	4.08	1.47	1.23	33.97 - 8.44	97.28 - 27.46	95.40 - 27.88	35.65 - 9.82	19.56 - 8.52					
AAPL	□ APPLE INC	SEP	9.28	6.49	5.72	6.38	4.01	19.78	17.52	18.71	17.17	11.10	134.54 - 92.00	119.75 - 70.51	82.16 - 55.01	100.72 - 58.43	60.96 - 44.36					
CRAY	§ CRAY INC	DEC	0.70	1.61	0.85	4.42	0.41	11.69	10.68	8.77	8.07	4.54 J	35.93 - 18.00	42.09 - 24.23	28.59 - 15.41	16.02 - 6.09	8.38 - 4.96					
DBD	† DIEBOLD NIXDORF INC	DEC	0.89	1.77	(2.85)	1.29	2.24	2.87	5.56	6.51	8.49	8.36	38.94 - 29.16	41.45 - 32.05	35.40 - 27.59	42.93 - 27.66	37.12 - 24.70					
EFII	§ ELECTRONICS FOR IMAGING INC	DEC	0.71	0.72	2.34	1.79	0.59	7.39	10.24	9.91	7.63	7.55	49.82 - 35.45	47.75 - 36.62	39.87 - 18.97	19.10 - 12.89	19.17 - 12.71					
HPE	□ HEWLETT PACKARD ENTERPRISE	OCT	1.37	0.90	1.12	NA	NA	NA	NA	NA	NA	NA	18.50 - 13.12	NA - NA	NA - NA	NA - NA	NA - NA					
HPQ	□ HP INC	OCT	2.51	2.66	2.64	(6.41)	3.38	(3.98)	(3.55)	(3.68)	(6.70)	(8.45)	41.10 - 11.30	40.95 - 27.27	28.70 - 14.74	30.00 - 11.35	49.39 - 21.50					
NCR	† NCR CORP	DEC	(0.94)	1.08	2.73	0.88	0.32	(23.47)	(12.29)	(2.71)	(1.24)	(3.45)	36.50 - 21.79	37.73 - 22.83	41.63 - 25.64	25.99 - 16.39	20.97 - 15.28					
NTAP	□ NETAPP INC	# APR	0.78	1.77	1.87	1.40	1.66	3.65	7.50	8.25	9.95	8.65	41.79 - 25.21	45.96 - 33.34	44.65 - 31.74	46.80 - 26.26	61.02 - 33.00					
STX	□ SEAGATE TECHNOLOGY PLC	JUN	5.38	4.66	4.97	6.72	1.13	5.62	5.93	7.27	6.38	5.73	67.21 - 32.38	69.40 - 48.21	57.07 - 30.26	35.71 - 16.21	18.60 - 9.05					
SMCI	§ SUPER MICRO COMPUTER INC	JUN	2.19	1.24	0.50	0.72	1.04	13.05	10.36	8.83	8.14	7.13	42.00 - 22.31	37.00 - 16.29	17.23 - 9.20	18.87 - 7.85	19.30 - 11.40					
WDC	□ WESTERN DIGITAL CORP	JUN	6.31	6.88	4.07	6.69	3.14	26.61	24.91	22.51	19.90	22.60	113.88 - 57.94	114.69 - 80.78	84.70 - 41.62	45.94 - 28.31	41.87 - 22.64					
XRX	□ XEROX CORP	DEC	0.50	0.92	0.95	0.90	0.92	(1.99)	(0.84)	(0.22)	(1.02)	(0.58)	14.15 - 9.17	14.36 - 10.26	12.28 - 6.97	8.84 - 6.10	11.79 - 6.55					

Note: Data as originally reported. □ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

J-This amount includes intangibles that cannot be identified.

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