TABLETS IN THE ENTERPRISE: COMPARING THE TOTAL COST OF OWNERSHIP

EXECUTIVE SUMMARY

Windows 8 tablets provide a PC experience, which for many workers is essential to maintaining productivity. With Windows 8, users can run familiar desktop applications, maintaining productivity without having to find new ways to carry out their tasks. They can read, edit, and print their emails and Office documents—tasks that can be a challenge on other tablets. In addition to these productivity advantages, Intel Core i5 processor and Windows 8 tablets can provide enterprises with total cost of ownership (TCO) savings of up to 18 percent compared to other tablets. We expect additional TCO savings with Intel Core vPro™ processor-based tablets due to their additional manageability capabilities.

We estimate tablets with Intel Architecture and Windows 8 will have lower TCO than other tablets, primarily due to the following:

- reduced software costs
- lower management costs
- improved end-user productivity

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TOTAL COST OF OWNERSHIP OF TABLETS IN THE ENTERPRISE

In this paper, we first present a TCO analysis for a hypothetical enterprise considering four major categories of tablets for their employees: Microsoft Windows 8 tablets, Windows RT tablets, Android tablets, and Apple iPads. Because the ranges of prices and capabilities differ among models within each category, we selected a single representative model for each. Following this analysis, we discuss the dominant issues in enterprise tablet computing as of this writing.

We base our TCO analysis on the primary assumptions in Figure 1.

- Tablets must be nine inches or larger with 64 GB of storage and Wi-Fi support.
- Users need a keyboard and a keyboard cover or dock for each device.
- Users need 2-year support with accidental damage protection for each device.
- Users must be able to read and edit Microsoft Word® documents and Excel® spreadsheets, and to access documents on SharePoint® and email on Microsoft Exchange.
- Each user has a Microsoft Enterprise CAL Suite license.
- TCO includes the cost of the device itself and accessories such as keyboards and cases, hardware support, software and software support, deployment, user training, and help desk support.
- IT would manage Windows 8 tablets with Microsoft System Center Configuration Manager (SCCM) 2012 Service Pack 1, Windows RT with SCCM plus Microsoft Intune™, and would use a cloud-based mobile device management (MDM) tool for a range of iOS or Android devices.

Figure 1: Primary assumptions of our TCO analysis.

As Figure 2 shows, the representative Windows 8 tablet we considered delivered the lowest total cost of ownership over a two-year period.

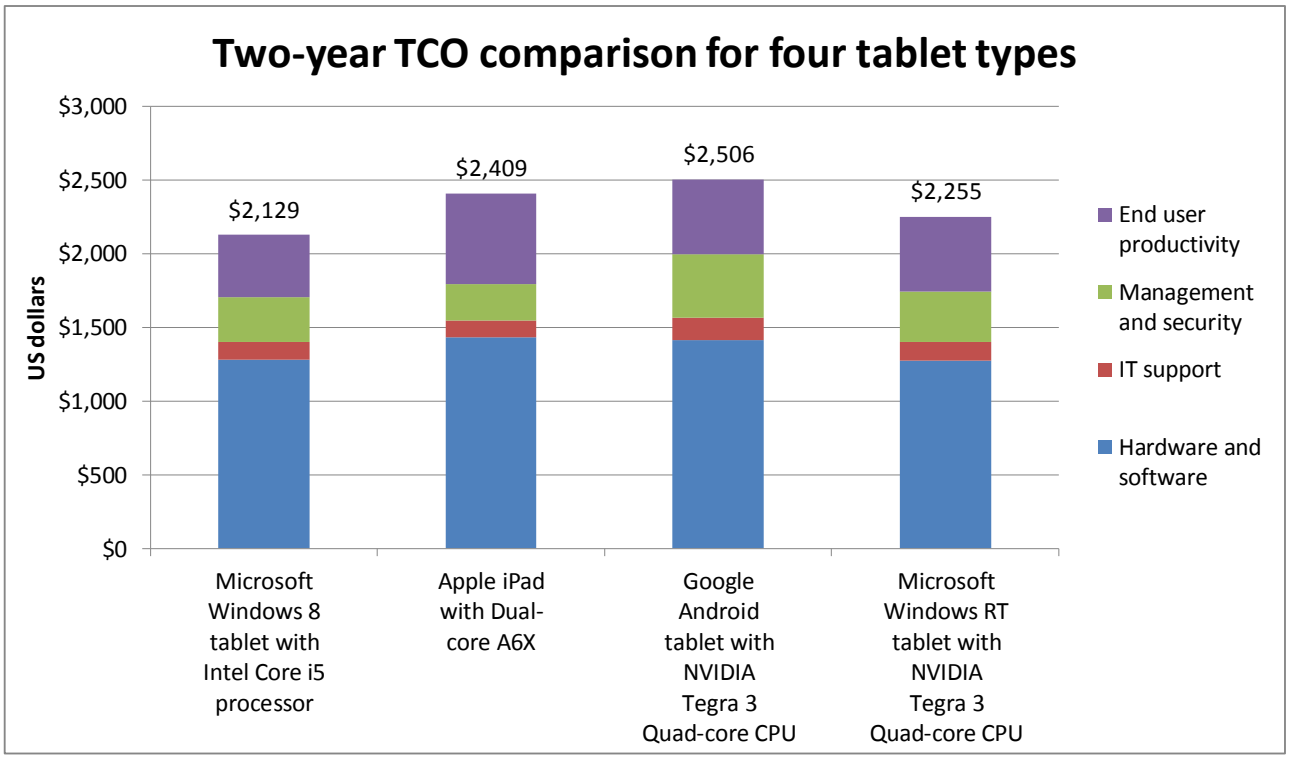

Figure 2: Total cost of ownership over two years for the four tablets we analyzed.

In the following sections, we explain our analysis and the numerous secondary assumptions we have made.

Hardware and software

Figure 3 presents the models we selected as representative of the four categories of tablets our hypothetical enterprise is considering. None of the models allowed us to select different memory amounts.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Model	Acer ICONIA W700-6602	Apple iPad with Retina display	ASUS® Transformer Pad Infinity TF700T	Microsoft Surface RT
Processor	Intel® Core™ i5-3317U Processor (1.7GHz)	Dual-core A6X with quad core graphics	NVIDIA Tegra® 3 Quad-core CPU	NVIDIA Tegra 3 Quad-core CPU
Memory	4 GB	1 GB (assumed)	1 GB	2 GB
OS	Windows 8 64-bit edition	iOS 6	Android 4.1. Jelly Bean	Windows RT
Display	11.6”	9.7”	10.1”	10.6”

Figure 3: Configuration information for the four tablets we analyzed.

While any of the devices we compared could be a notebook replacement for a light PC user who needs only the capabilities of a minimally configured notebook, only the Intel Core processor-based Windows 8 tablets could replace the notebook of a medium PC user. Figure 4 shows the costs of the tablets we analyzed.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Tablet cost (undiscounted)	$899.99	$699.00	$599.99	$699.00
Support plan	Third-party two-Year Tablet Protection w/Accidental Damage from Handling Coverage $164.99	AppleCare+ with two incidents of accidental damage $99.00	Third-party two-Year Tablet Protection w/Accidental Damage from Handling Coverage $124.99	Two-year Microsoft Complete with Surface support $99.00
Keyboard	Keyboard and stand included N/A	Logitech Ultrathin Keyboard Cover $99.95	Keyboard dock $149.99	Touch cover with keyboard included N/A
Hardware subtotal	**$1,064.98**	**$897.95**	**$874.97**	**$798.00**

Figure 4: Hardware cost information for the four tablets we analyzed.

We include undiscounted hardware cost, 2-year support cost including coverage for accidental damage, and the cost of a keyboard if the base device configuration does not include one. For the Acer tablet, we cite the tablet cost from the Acer Web site and include two-year tablet protection from SquareTrade. For the Apple iPad, we include the cost of the tablet listed on the Apple Web site and include the cost of AppleCare+® with support for two incidents, and added the cost of a Logitech® Ultrathin Keyboard Cover for the iPad that Apple includes in the list of suitable accessories. For the ASUS Transformer Pad Infinity TF700T Android tablet, we include the advertised device list price and a 2-year tablet protection plan with accidental damage from SquareTrade. We added the price for a keyboard dock from the list of accessories available for the tablet. For the Microsoft Windows RT tablet, we included Microsoft's advertised price for the tablet and 2-year Microsoft Complete with Surface support plan. The prices for the four devices were within a $267 range with the Windows RT tablet lowest at $798 and the Windows 8

tablet highest at $1,065. We could have selected a lower-priced Microsoft Windows 8 tablet with an Intel Atom processor, as they are typically closer in price to the iPad and Android tablets, but we felt the Intel Core i5 processor-based tablet would be more desirable as a notebook replacement. Figure 5 details the software costs for each tablet.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Microsoft Office	Microsoft Office Home and Business 3 $219.99	OnLive Desktop Plus at $4.99/month for 24 months $119.76	OnLive Desktop Plus $119.76	Office 365 Professional Plus at $20.00/month $480.00
Microsoft SharePoint access	Included in CAL suite N/A	SharePlus SharePoint app $19.99	SharePlus SharePoint app $19.99	Included with Office 365 N/A
Cloud storage	Not needed N/A	Dropbox Pro 200 at $199.00/year for 2 years $398.00	Dropbox Pro 200 at $199.00/year for 2 years $398.00	Not needed N/A
Software subtotal	**$219.99**	**$537.75**	**$537.75**	**$480.00**

Figure 5: Software cost information for the four tablets we analyzed.

We chose software that would allow access to Microsoft Office, Microsoft Exchange, and SharePoint for each platform, either locally or cloud-based. We assume each user has a Microsoft Enterprise CAL Suite license. For the Windows 8 tablet, we chose Microsoft Office Home and Business 2013. For the Apple iPad, we chose OnLive Desktop available for both the iPad and Android platforms. A free version accesses a cloud desktop with Microsoft Word, Excel, and PowerPoint. A $4.99 per-month service plan adds Dropbox support, priority access, and other features. Competitor CloudOn is currently free. The CloudOn app accesses cloud-hosted copies of Microsoft Word, Excel, and PowerPoint. We include the OnLive Desktop Plus $4.99 per month service plan in the cost analysis because we expect that over the two years of this model, apps that are currently free will introduce tiered pricing, as CloudOn has said it might, and leave only basic features in the free version. Alternatively, enterprises might migrate to apps that integrate with Office 365 and will need to add its monthly cost to their budget.

For cloud storage to use with OnLive Desktop, we selected Dropbox Pro 200 because of its security.[1] We assumed the user would use the built-in iPad email app to access Exchange email. The Google Android tablet came pre-loaded with Polaris Office, but because that software is not completely compatible with Microsoft Office, we added OnLive Desktop Plus and Dropbox Pro 200 to that solution as well. The Microsoft Windows RT-based tablet includes Office 2013 Home and Student 2013 RT Preview, but not with a commercial license, and does not include Outlook®. For it, we added the cost of Office 365 Professional, which provides cloud-based versions of Microsoft Office applications, plus SharePoint. Office 365 Professional Plus includes the right to run Office on up to five devices for a worker. We assume one of the five licenses will license a Surface RT tablet for Microsoft Office use in the enterprise. In cases where the tablet is a companion device, there could be some savings by sharing the license with a notebook or desktop.[2]

In this analysis, the software cost includes only Microsoft Office, Microsoft SharePoint, and cloud storage. It does not include additional costs associated with porting and migrating enterprise/in-house applications to run on non-Intel architecture/non-Windows devices. This would add more cost to non-Intel architecture/non-Windows devices. Different software choices could yield very different TCO results.

IT support

Figure 6 includes our estimate of IT support costs for the four devices. We include help desk calls, and on-site repair, and time to handle devices that suffer accidental damage.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Help desk calls	$80.00	$68.00	$112.00	$88.00
On-site repair	$12.00	$10.20	$16.80	$13.20
Accidental damage (10% per year)	$24.05	$33.85	$24.05	$24.05
IT support subtotal	**$116.05**	**$112.05**	**$152.85**	**$125.25**

Figure 6: IT support cost information for the four tablets we analyzed.

[1] We used the price per additional user of $199 per year. https://www.dropbox.com/teams/pricing

[2] http://www.symantec.com/content/en/us/about/media/pdfs/b-ponemon-2011-cost-of-data-breach-us.en-us.pdf

We assume a help-desk call-volume of one call per year at $40 each for Windows tablets. Here again, the Windows 8 tablets can be supported with the same trained staff and procedures that IT uses to support Windows desktops and notebooks. The fact that Windows tablets run applications locally is a benefit for users, but adds to the complexities of its support. Mobile tablet apps are less complex than these traditional software applications and require less support. However, in our model, the mobile tablets are running cloud versions of desktop applications so the difference in support costs among the devices is not as large as it would otherwise be. Support costs are higher for the Android devices for the same reasons that administration costs are higher – different OS versions complicate support.

For the Windows 8 tablet, we include an estimate of $200 per incident for on-site repair and assume that 3 percent of systems require one repair a year for an average of $12 repair cost over two years per device.

We include conservative estimates of accidental damage and repair costs for each device. These prices are low because each device has a vendor support agreement. We assume that 10 percent of each type of device suffers breakage per year. For the iPad, we add in one-tenth of the $49 Apple charges for accidental breakage per incident year. For all devices, we assume that for each incident IT requires 3 hours for rebuilding the device image at a staff cost of $240 and assign one-tenth of that cost per year per device.

Management and security

Figure 7 shows our estimates of management and security costs for the four devices.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Management and security	$307.80	$246.24	$430.92	$341.66

Figure 7: Management and security cost information for the four tablets we analyzed.

We estimate the cost for the Windows 8 tablet based on our experience with Windows notebook management costs. For management, we include device administration. IT can move smoothly to managing Windows 8 tablets and keep costs low because IT administers Windows 8 tablets with the same

tools and best practices it uses to administer tablets and desktops. We assume one administrator per 500 clients for Windows 8 tablets.

We assume IT staff uses a capable cloud-based MDM to manage a range of iOS or Android devices. We estimate based on capabilities we expect in the management software after the release of SCCM SP1 and Windows Intune updates. We estimate the Apple iPad will have a lower administration cost than the Windows 8 tablet because it will be running critical applications in the cloud rather than locally, making it easier to manage but more difficult to secure. We estimate that the Apple iPad will have a lower repair cost because IT can do little in terms of hardware repair other than replace the device. For the Google Android tablet, we assume higher administration costs because administration is complicated by the problems we discussed earlier with operating system (OS) updates and differences in OS versions. For the Windows RT tablet, we assume a higher cost than for the Windows tablet because these tablets run a consumer version of Microsoft Office, do not run Microsoft Outlook directly, and lack some of the capabilities users expect from Windows devices, adding to user confusion and administrative complexity. These devices also require Microsoft Intune for management, rather than the SCCM software used for other Windows 8 devices, which adds a layer of complexity and additional cost.

End-user productivity

We include end-user time costs in the end-user productivity estimate. Figure 8 shows our estimates of user downtime and training time for the various devices and the costs of that time.

	Microsoft Windows 8 tablet with Intel Core i5 processor	Apple iPad with Dual-core A6X	Google Android tablet with NVIDIA Tegra 3 Quad-core CPU	Microsoft Windows RT tablet with NVIDIA Tegra 3 Quad-core CPU
Lost productivity due to downtime	$300.00	$375.00	$270.00	$270.00
Cost of lost productivity on all but high-performance Windows 8 platform	N/A	$120.00	$120.00	$120.00
Training time (2 hours at $60 per hour)	$120.00	$120.00	$120.00	$120.00
End-user productivity subtotal	**$420.00**	**$615.00**	**$510.00**	**$510.00**

Figure 8: User downtime cost estimates for the four tablets we analyzed.

We estimate the average hourly salary plus benefits of that level staff at $60 per hour. We include an estimate of lost productivity due to hardware or software problems and the time end users spend fixing their tablets and installing their software.

We estimate that users suffer at a minimum two hours per year in lost productivity compared to the high-performance Windows 8 platform with the iPad, Android, and Windows RT devices. A key to that loss is that email software packages for mobile devices lack some of the capabilities of Outlook. We also penalize these devices because they do not support true multi-tasking, a feature of Windows tablets that lets workers move smoothly among their email and other productivity software. Users also lose time setting up peripherals and installing apps. We also add 2 hours per user for training on each device at the same salary rate.

Other savings

We do not quantify all savings you might realize with Windows 8 tablets. Other areas include the following:

- IT can offset much of the cost of providing and supporting tablets if the tablets replace existing notebooks or desktops, especially on an already scheduled refresh cycle. IT has a range of mobile touch devices with Intel architecture and Windows 8 that you can consider for notebook or desktop replacement including tablets, detachables, convertibles, and Ultrabook devices with touch.
- In cases where a tablet is a companion device (not replacing an existing notebook or desktop), Microsoft Office licenses offer another potential area of savings. If IT chooses a version that allows a single license to cover both a user's notebook and tablet, such as the Office 365 Professional Plus that we include for the Windows RT tablet, it can reduce the software cost of the tablet. However, there are limitations and tradeoffs when using Office 365 Professional Plus as compared to a local version of Office Professional.
- The robust security available with Windows tablets through firmware, hardware, and management tools can save the enterprise the cost of security breaches and penalties. The cost of security and management tools and processes is small compared to the potential

costs related to data breaches or lost devices. Health care organizations and other industries have detailed privacy and security rules and hefty fines for failure to comply. Cleaning up the mess caused by the loss of a single device that stores or has insecure access to sensitive personal data on customers or clients can cost a company millions of dollars. One study reported the average cost per record of a healthcare data breach in 2011 was $240.[3] A fine of 1.5 million dollars was recently levied for a violation of the Health Insurance Portability and Accountability Act related to the loss of as unencrypted notebook with patient information stored on it.[4] Tablets face the same rules and penalties. While some tablets store minimal data locally, if they have unprotected access to sensitive data on corporate SharePoint or email servers or the Web, their loss or theft jeopardizes the security of that data.

Other costs

Cellular access

Most tablets are Wi-Fi only; the Apple iPad and some Android tablets have options for cellular access. The Surface RT is Wi-Fi only. Cellular access adds additional cost to the hardware and adds a monthly cellular cost. For example, adding the cellular feature adds $130 to the price of the 64GB iPad with Retina display.

To use the cellular feature, you must sign up for a cellular data service plan from a carrier such as AT&T®, Sprint®, or Verizon®. Each carrier offers various plans priced based on data usage, number of devices on the plan, and other factors. The Apple Store Web page lists three rate plans for each provider for the iPad with Retina display.[5] The middle plan with 2 to 3 GB of data per month costs $30.00 to $34.99 per month. That middle plan would add a 2-year cost of $720.00 to the tablet cost.

Application development

Software-application development efforts can be shared among Windows 8 and other Windows devices, including notebooks and desktops,

[3] http://www.symantec.com/content/en/us/about/media/pdfs/b-ponemon-2011-cost-of-data-breach-us.en-us.pdf

[4] http://www.crn.com/news/security/240145780/hipaa-healthcare-data-breach-fines-climb-with-enforcement-boost.htm;jsessionid=79cYHbN0Youdk8GifhRh9A**.ecappj02?pgno=2

[5] http://store.apple.com/us/buy/home/shop_ipad/family/ipad

whereas other tablets require OS-specific development for applications you want to run locally on them.

An IDC survey found that close to 80 percent of respondents reported their organizations were developing enterprise applications for iOS platforms and almost 70 percent were developing them for Android platforms for an average of two applications and two platforms.[6] Application development can be a cash sink for an enterprise, with costs ranging from tens to hundreds of thousands of dollars per application and platform depending on and the size and complexity of the app. If that development is porting in-house Windows applications to other tablet platforms, IT could save those costs by using Windows 8 tablets.

TCO summary

When we considered costs related to hardware and software, IT support, management and security, and end-user productivity, the representative Microsoft Windows 8 tablet provided the lowest cost of ownership over two years. It achieved this advantage even without considering a number of other factors we did not quantify in our analysis.

[6] https://www.eiseverywhere.com/file_uploads/6cb52ed13036bf97166daa5c9ff590f4_ITR_Denver_2012_Rick_Nicholson_IDC_Energy_Insights.pdf

ENTERPRISE TABLET COMPUTING: AN OVERVIEW

In this section, we summarize the tablet options available to enterprises and look at some of the issues they must consider.

The changing landscape

Over the past couple of years, tablets have moved quickly from consumer devices to essential productivity tools for enterprise workers. Experts expect the tablet market share to continue to grow in the next few years. Headlines suggest that 2013 may be the year of the tablet—tablets may outsell notebooks this year.[7] Global sales forecasts for tablets range from IDC's recent estimate of 282.7 million sales in 2016[8] to Forrester's estimate that sales will top 375 million that year.[9]

Whether the tablets are purchased by employers or by workers themselves—known as BYOD or bring your own device—they are typically used as both personal and professional devices and are companion devices, supplementing workers' notebooks and desktop systems. Tablets appeal to workers because of their portability, ease of use, long battery life, and the applications they run. Enterprises are starting to embrace them, but they can be an enormous corporate expense.

A 2011 IDC survey found that 49 percent of enterprises provided tablets for employees—primarily executives, sales, and IT staff.[10] That percentage continues to grow. Gartner anticipates that by 2016, tablet purchases by businesses will triple.[11]

Even when employees provide their own devices, the costs to enterprises can be significant. Enterprises must pay to manage and secure tablets and the corporate data they can access. They incur additional costs delivering content and applications to tablets and providing help desk support for them. For example, a business might adopt thin client solutions such as cloud hosting, virtualized desktops so that workers can run desktop applications on their

[7] http://www.hindustantimes.com/technology/IndustryTrends/2013-will-be-the-year-of-the-tablet/SP-Article1-962677.aspx

[8] http://www.idc.com/getdoc.jsp?containerId=prUS23833612

[9] http://blogs.forrester.com/node/8252

[10] https://www.eiseverywhere.com/file_uploads/6cb52ed13036bf97166daa5c9ff590f4_ITR_Denver_2012_Rick_Nicholson_IDC_Energy_Insights.pdf

[11] http://techcrunch.com/2012/11/06/gartner-1-2-billion-smartphones-tablets-to-be-bought-worldwide-in-2013-821-million-this-year-70-of-total-device-sales/

tablets, or invest in file sharing solutions designed for mobile platforms so that workers can access their work files on their mobile devices. Creating tablet-specific applications can greatly increase the enterprise's development costs. These software, management, and development costs add up. The total cost of ownership of a tablet to the enterprise may equal or exceed the cost of a notebook or desktop. This expense is usually on top of the expense for a worker's notebook or desktop system and smartphone.

In December 2012, Forrester reported on a survey that showed that among business users, 33 percent used Apple tablets, 22 percent used Android tablets, and 10 percent used Microsoft Windows tablets.[12] This Apple and Android dominance in the business tablet market may be short-lived with the release, roughly coincident with this survey, of two new Windows operating systems for tablets.

In late 2012, Microsoft released Windows 8, which runs on both PCs and tablets. Several vendors have released Windows 8 tablets with Intel architecture. In addition to the tablet form factor, a variety of other mobile touch devices with Intel architecture and Windows 8 are available, including convertibles, detachables, and Ultrabook devices that give enterprises the ability to choose the type of device and OEM that best suits their needs.

Windows 8 runs both current Windows 7 desktop applications and new full-screen, touch-friendly Windows 8-style apps. Users can supplement the built-in apps and programs with apps they download from the Microsoft Windows Store, many of which are free. Users can also install and run third-party desktop applications, including those integral to business productivity and operations.

Microsoft has also introduced the Windows RT operating system, which is available only with the purchase of a less-powerful ARM processor-based Windows RT tablet. Microsoft released Windows RT on its own Surface RT tablet and other vendors have released tablets with Windows RT. Windows RT systems run only built-in apps or apps downloaded from the Windows Store, and do not include the full features of the Windows 8 release. Both Windows 8 and Windows RT challenge what had been a two-way tablet OS race.

[12] http://go.bloomberg.com/tech-blog/2012-12-18-more-people-would-rather-have-no-tablet-than-an-android-tablet/

Why Windows 8 tablets are a win for enterprise

Windows 8 tablets have advantages over iPad tablets, Android tablets, and Windows RT tablets for both enterprise users and their IT departments. Windows 8 tablets are essential for enterprise users who need to have a PC experience on their tablet or need to access their Windows Exchange email and edit their Word documents and Excel spreadsheets. Windows 8 tablets are desirable for enterprise IT because they staff can manage them with the same tools and procedures as PCs.

Workers are seeing the advantages of Windows tablets. In late 2012, Forrester surveyed information workers worldwide and asked them which tablet they desired. More workers (32 percent) wanted a Windows tablet than an Apple tablet (26 percent) or an Android tablet (11 percent). Only 17 percent did not want a tablet at work. The remainder had no preference or chose other tablets.[13] In November 2012, Gartner predicted that Windows 8 would gain a 39 percent share of business market for tablets and ultra-mobile devices by 2016.[14] The PC experience Windows 8 tablets provide by allowing users to run familiar Windows applications can help maintain productivity. They can read, edit, and print their emails and Office documents, bread-and-butter tasks that can be a challenge on other tablets.

In addition to the productivity advantages, Windows 8 tablets can also provide TCO advantages over other tablet platforms. As we noted above, enterprises can save on management and security costs because staff can manage and secure Windows 8 tablets with the same tools they use to manage the enterprise's Windows notebooks and desktops. The robust built-in manageability and security of Windows 8 tablets better protects the enterprise from loss and its associated costs. Whereas other tablets may require expensive customized apps and infrastructure, Windows 8 tablets can run the same applications and use the same tools as other Windows devices. Because Windows 8 tablets can replace some workers' existing Windows notebooks or desktops where the task favors attributes such as ultra-mobility or stand-all-day computing, the enterprise can save on the costs of those devices by not needing to provide or support two devices.

[13] *Ibid*.

[14] http://techcrunch.com/2012/11/06/gartner-1-2-billion-smartphones-tablets-to-be-bought-worldwide-in-2013-821-million-this-year-70-of-total-device-sales/

The tablet market

Windows 8 tablets have advantages over the two leading tablet vendors' Apple iPad and Google Android tablets, as well as the new Windows RT. Below, we describe and compare the tablets. We group the Apple iPads and Google Android devices because they are both mobile devices that have emerged from the consumer market into the enterprise. Windows 8 tablets trace their lineage from enterprise-ready notebooks and desktops. Windows RT straddles the line—its background is Windows, but seems to target consumers rather than the enterprise.

Apple iPad and Google Android tablets

Apple iPad and Android tablets are in many ways tablet versions of iPhones and Android smartphones minus the phone capabilities. The tablets and their corresponding smartphones run the same operating systems, share many of the same apps from their vendor's app store, and require the same management tools. The tablets typically have long battery lives.

Apple iPads are in their fourth generation, with the latest version being the 9.7-inch iPad with Retina display. The base configuration iPad with Retina display costs $499, includes 16 GB of storage, and connects to the Internet over Wi-Fi networks. The most expensive configuration currently available on the Apple site, which costs $829, includes 64 GB of storage and connects to the Internet over Wi-Fi or cellular networks. As of this writing, Apple has announced that a model with 128GB storage will soon be available. Apple recently introduced a smaller-screened iPad mini at a lower price. As with the standard iPad, the mini is available in three storage sizes—16 GB, 32 GB, and 64 GB—and two networking options, Wi-Fi only or Wi-Fi plus cellular networking.

The iPad has built-in apps such as a browser, mail, camera, eBook reader, FaceTime®, and maps. It also includes access to Apple's App Store℠ with over 700,000 apps; more apps appear every day and at least 275,000 of them have been customized for the iPad. Despite the proliferation of apps, one study found that only 111,540 of them have gained any traction.[15] App Store apps are free or nominally priced. Some apps connect to cloud-based services that charge monthly fees.

[15] http://www.pcmag.com/article2/0,2817,2413376,00.asp

A number of vendors offer open-source Google Android OS tablets of varying sizes and capabilities. Some convertible Android tablets include detachable keyboards for ease of data entry.

At least half of the Android tablet market share comes from consumer purchases of advanced e-readers such as the popular Amazon® Kindle Fire® and Barnes and Noble Nook® tablets. These devices have limited functionality compared to other tablets and are still primarily consumer, not enterprise, devices.

Microsoft Windows 8 tablets

Windows 8 runs on a variety of devices including PCs, Ultrabook devices, convertibles, tablets, and more. Windows 8 runs both existing Windows 7 desktop software and new touch-enhanced, full-screen apps that you download from the Windows Store. Windows 8 Pro adds enhanced networking and data encryption features. Windows 8 tablets are available in two main versions: thin and light tablets designed to run everyday tasks with a long battery life, and performance tablets capable of running more resource-intensive applications. The thinnest and lightest tablets use Intel Atom processors, while performance tablets use the same Intel Core processor family as many Windows 8-based notebooks and Ultrabook devices use.[16] A third Windows 8 device is the convertible, which comes in many innovative form factors where a single device serves as a notebook and tablet in one. Convertibles can use Intel Core processors or Intel Atom processors. Convertibles that meet the requirements for Ultrabook devices are sometimes referred to as Ultrabook convertibles.[17] Microsoft is releasing its own Windows 8 Pro tablet, the Surface Pro, likely to be priced at $899 for a unit with 64 GB of internal storage with a keyboard case available for an additional $120 to $130. A model with 128 GB of storage will be $100 more. A number of Intel architecture and Windows 8 mobile touch devices are available from a variety of OEMs, including thin and light tablets with the Intel Atom processor, performance tablets with the Intel Core processor, Ultrabook devices, and convertibles.

[16] Intel provides a good overview of the three versions: http://www.intel.com/content/www/us/en/processor-comparison/how-to-choose-the-right-processor.html#!tablets

Intel showed new chips for Windows 8-based tablets at the 2013 Consumer Electronics Show. Intel announced the quad-core Intel Atom processor for tablets that they say includes improved security features, provides daylong battery life, and offers more than twice the performance of the current generation Atom processor. Intel also announced that its 3rd and 4th Generation Intel Core processor Y Series would have an SDP (scenario design power) of 7 watts, enabling thinner and lighter designs with Intel Core processors.

Buyers can be confused about the differences between Windows 8 and Windows RT tablets. Figure 9 describes the key differences between the operating systems.

Two kinds of Windows tablets: the differences at a glance

Windows 8, Windows 8 Pro, Windows 8 Enterprise	Windows RT
Available with either Intel® Core™ processors or Intel Atom™ processors.	Only available with ARM processors.
Runs professional versions of Microsoft Office applications, including Outlook.	Includes Office Home & Student 2013 RT Preview editions of Word, Excel, PowerPoint, and OneNote licensed for non-commercial use. Enterprise use requires an additional license. Does not include Outlook or support its installation.
Runs current Windows desktop applications, third-party desktop applications, and touch-friendly Windows 8 apps (either built-in or available in the Windows Store).	Runs touch-friendly Modern UI apps created specifically for Windows RT (either built-in or available in the Windows Store).
Can be managed with Microsoft System Center Configuration Manager like a PC.	Can be managed by Microsoft Intune and Microsoft Exchange ActiveSync like a smartphone.

Figure 9: Differences between Windows operating systems.

Microsoft Windows RT tablets

Windows RT runs only on devices with ARM processors. It competes more with the iPad in capabilities and price, while the Windows 8 tablets compare more with notebooks or Ultrabook devices. Windows RT includes built-in touch-friendly apps like Mail, Calendar, Photos, Messaging, and SkyDrive. Windows RT also includes Office Home and Student 2013 RT Preview for non-commercial use and Microsoft Internet Explorer 10. Interestingly, Windows RT does not run Microsoft Outlook—probably the most-used Microsoft Office application—locally. Microsoft released its own ARM processor-based Windows RT tablet in October, the Microsoft Surface RT. It is lightweight and has a long battery life. The base 32GB model is priced at $499. The 64GB model, which comes with a keyboard cover, is $699. Microsoft Surface RT has advantages over iPad and Android devices. It connects easily to certain printers, supports Flash, has a keyboard and touchpad for content creation, comes with a version of Microsoft Office preloaded, supports multiple user accounts, and allows true multi-tasking. It also includes a micro SD card slot for additional storage and USB 2.0 for more storage via flash drives. Several other vendors also offer or are planning to offer Windows RT tablets.

Applications and apps

Microsoft Windows 8 tablets

Users can run the same Windows applications on their notebooks and Windows 8 tablets, including Microsoft Office and Microsoft Outlook. They can also run apps, both preinstalled ones and those they purchase and download from the growing list of apps at the Microsoft Windows Store.

Apple iPads and Google Android tablets

The tablets and their corresponding smartphones share their vendor's app stores and run many of the same apps, although many apps are customized for—and some are exclusive to— the tablets. The Apple App Store and Google Play claim to offer over 700,000 apps.

Microsoft Windows RT tablets

Microsoft Windows RT tablets run many of the same Windows Store apps as Windows 8 tablets and provide a few preinstalled desktop applications,

including Microsoft Office Home and Student 2013 RT Preview. They do not run other desktop applications.

Reading and editing Microsoft Office documents and sending email

Workers increasingly want to read and edit Microsoft Office files on their tablets and access their Microsoft Exchange email stores, so selecting devices that can complete these basic, everyday tasks is important.

iPad and Android tablets

It is not yet possible to run Microsoft Office locally on iPad or Android tablets. Apple iOS or Google Android apps available for these devices include some capabilities to read and edit Office documents and spreadsheets but are not fully compatible with Microsoft Office, and many files experience document decay.

For now, workers who want to run these Microsoft Office applications on their iPad or Android tablets must do so remotely from a cloud service or through a VDI desktop.[18]

Windows 8 tablets

With Windows 8 tablets, users can install the full suite of Microsoft Office applications just as they would on a Windows 8 notebook. In some cases, a user can even share a single license between his or her notebook and tablet. Windows 8 tablets run Microsoft Outlook locally as well.

Windows RT tablets

Windows RT tablets include Office 2013 Home & Student 2013 RT Preview, which is licensed only for non-commercial use. Enterprise use of Office 2013 Home and Student 2013 RT Preview requires purchasing an additional license. Windows RT tablets do not include local versions of Microsoft Outlook. They have Mail, People, and Calendar apps that can integrate with Exchange using Exchange ActiveSync® but have a different look and feel from Outlook and lack the full Outlook feature set. To run Outlook, users must do so remotely from a cloud service or remote desktop.

[18] IDC Mobile Benchmark Survey found that 22 percent of their respondent organizations were currently using virtual desktop interface (VDI) on tablets. https://www.eiseverywhere.com/file_uploads/6cb52ed13036bf97166daa5c9ff590f4_ITR_Denver_2012_Rick_Nicholson_IDC_Energy_Insights.pdf

Management and security

The cloud-based tasks that users of personally owned tablets typically carry out on their devices such as email can create security issues. An IDC study found that most corporations support Web browsing or Internet access, email, and intranet access to tablets.[19] Tablets running those applications gain access to valuable corporate intellectual property, putting that data at risk. Intranet access with file browser, SharePoint, and VPN apps give them access to corporate file stores. File-hosting services and apps let workers move files from secure corporate storage to third-party clouds. Organizations that do not address management and security for these tablets properly risk violating legal and regulatory requirements that protect data on servers and mobile devices.

Because workers rely on tablets for productivity, IT must take responsibility to keep them and their applications running just as they do the PCs in their environments. This is true of both employer-provided and BYOD devices. Tablet management requires management software and procedures.

Some organizations use Exchange ActiveSync (EAS) to control iOS and Android mobile devices. EAS is a protocol to communicate between mobile device email clients and Microsoft Exchange servers. EAS supports some useful device management features and policies, but is not a full mobile device management solution. iOS devices and the various Android devices support different capabilities. EAS can disable apps (such as the camera and browser on iOS devices), set password control, and wipe data remotely. EAS is of limited use managing Windows 8 devices. EAS does not recognize the Windows 8 device as a mobile device, so these devices can only utilize a few of the email policies via the Mail app in the start screen. In general, PC management tools manage Windows 8 devices better than mobile device management tools.

For robust security and manageability, enterprises have deployed and relied on PC management tools for years. IT staff can manage Windows 8 tablets in the same way, with the same tools that are likely already in place in the enterprise. IT typically manages iPad, Android, and Windows RT devices with mobile device management tools that enterprises are less likely to have currently in place and that do not yet have the full set of capabilities of Windows management tools. If the enterprise does not have robust MDM tools in place,

[19] https://www.eiseverywhere.com/file_uploads/6cb52ed13036bf97166daa5c9ff590f4_ITR_Denver_2012_Rick_Nicholson_IDC_Energy_Insights.pdf

managing iPads, Android tablets, and Windows RT tablets will require greater effort and carry a higher cost than managing Windows 8 tablets.

Mobile device management

IT can manage iPad and Android tablets as they do smartphones with MDM and mobile application management (MAM) software and security solutions designed for those platforms that manage through Microsoft ActiveSync.

MDM solutions manage mobile device policies, permissions, configurations, security, and other aspects of mobile device use to ensure usage complies with corporate policies and regulatory requirements. These solutions usually include both device management features and application management features, including whitelisting and blacklisting of applications, data encryption, remote control over configurations, wiping a lost or stolen device remotely, and policy enforcement.

These tools can be on-premises, appliance-based, or cloud-based, and are available from managed service providers (MSP). Many of the MDM and MAM solutions do not offer the same level of management and security for the devices they manage that are available for Windows 8 devices with SCCM and other enterprise-grade manageability solutions. MDM platforms differ on features, scalability, and performance.

Not all vendors provide comprehensive mobile management and security, so enterprises may have to put together a solution from multiple vendors.

Osterman Research Inc. counted more than 80 MDM vendors in mid-2012.[20] One leading vendor, AirWatch®, offers a combined mobile device management, mobile application management, and mobile email management cloud-based package. The cost is $3.25 per device per month or a one-time $50.00 fee per device with a 20 percent annual fee.[21]

Android devices add a wrinkle to management. As Bloomberg quotes a Forrester analyst, many companies do not support Android devices beyond e-mail access[22] because Android devices support many different versions of the OS, adding complexity and cost to device management. He also notes that CIOs

[20] http://www.slideshare.net/mosterman/mobile-devices-in-the-enterprise-mdm-usage-and-adoption-trends
[21] http://www.air-watch.com/downloads/pricing/mdm-pricing-na.pdf
[22] http://go.bloomberg.com/tech-blog/2012-12-18-more-people-would-rather-have-no-tablet-than-an-android-tablet/

are avoiding Android devices because they think those devices are more susceptible to malware because Google is more reactive to security problems, while Microsoft and Apple are more proactive.[23]

Windows 8 tablets

Most enterprises have in place a management infrastructure to support Windows desktops and notebooks into which they can readily slot Windows 8 tablets. For example, if a business already uses the popular SCCM suite to manage Windows notebooks and desktops, IT can easily manage and secure Windows 8 tablets after upgrading to the latest SCCM 2012 service pack 1 (now in RTM). Windows 8 tablets can join network domains and use Remote Desktop Connection.

iPad and Android tablets

The open-source Android and the Apple iOS operating systems were originally designed as consumer devices. Only in later versions did the operating systems meet basic enterprise requirements for management and security by making the devices easier to manage through Exchange ActiveSync and associated tools. Management tools for the devices are rapidly evolving, adding many of the feature sets of Windows management tools.

Windows RT tablets

The enterprise can manage Windows RT tablets and other mobile devices either directly from the recent release of Microsoft's cloud-based Windows Intune device management solution or with Microsoft System Center 2012 Configuration Manager with SP1 by using a new Windows Intune connector. Windows RT requires Intune, because unlike Windows 8 tablets, Windows RT tablets cannot join a traditional Windows network domain, a prerequisite for PC management tools. The current Intune version costs from $6 to $11 per user per month.[24]

SUMMARY

Windows 8 tablets on Intel architecture should beat out the other tablets as day-to-day productivity tools for most workers, as well as provide definite TCO advantages to the business. In addition to the mobility and user experience

[23] http://go.bloomberg.com/tech-blog/2012-12-18-more-people-would-rather-have-no-tablet-than-an-android-tablet/
[24] http://www.microsoft.com/en-us/windows/windowsintune/support.aspx

of the tablet form-factor, Windows 8 tablets give workers the ability to run their current desktop applications. They can also use the growing number of apps available in the Windows Store.

The earliest Windows 8 tablets released with Intel Atom processors provide a satisfying experience for most knowledge workers running a typical mix of browser, Microsoft Outlook, and Microsoft Office productivity applications. For power users of those and other Windows applications, some Windows 8-based tablets can offer performance similar to an Ultrabook with 3rd generation Intel Core processors. Because it can do the work of a PC, the Windows 8-based tablet, with the addition of a keyboard and other accessories, can replace a PC for some workers and can serve as an excellent supplemental device for others. Convertibles are another strong option for PC replacement, providing the notebook and tablet experiences in one device.

The Windows 8 tablet is a win for IT, too. Windows 8 tablets integrate with the enterprise management infrastructure already in place to manage Windows devices and IT staff can manage them the same way as Windows notebooks. Unless an enterprise has in place a management infrastructure for iPhones and Android smartphones, it would need to piece together a set of new management tools and controls to manage iPads and Android tablets. Many of these tools do not have the same capabilities to SCCM and other Windows management platforms. Finally, selecting Windows 8 tablets can also save on development costs.

ABOUT PRINCIPLED TECHNOLOGIES

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