

Clash of the titans

Equity Research

Survey results confirm ecosystems drive platform stickiness

Many debate whether “open” or “closed” platforms will dominate today’s compute landscape of smartphones and tablets. This debate misses a deeper point on market structure, and we view the concept of two-sided markets, in which platform users consume an ecosystem of complements, as a more helpful framework for the discussion. In a two-sided market, a company creates a platform (iOS, Android, etc) that enables other companies, or complements (Facebook for example), to sell their products and services to platform users. Indeed, our survey of 1K+ mobile users highlights the ways ecosystems drive platform stickiness.

Tablet and smartphone share likely converge over time

Platform stickiness is set to drive convergence of OS share in tablets and smartphones as tablets increasingly become an anchor device given users spend more for content on these devices. If left without a meaningful competitor in tablets, Apple’s dominant share is likely to pull its smartphone share steadily upward over time. Thus, a credible tablet becomes a strategic imperative for Google, or they run the risk of a steady decline of Android smartphone share starting in CY13. For Microsoft, 2013 will be critical given it is coming from behind in both device areas and platform loyalty is raising switching costs.

HTML5 is a way off; but TV likely the next big battleground

Market disruption related to HTML5, the forthcoming web code standard with greatly improved media streaming, is at least 3-5 years out, and as such platform loyalty will continue to build in the meantime. Looking ahead, we believe the next big market disruption could be in the form of smart TVs. These devices, integrated with existing mobile ecosystems, could be the battleground for the next big compute revolution. As such, smart TVs’ ability to become another platform component will likely mean significant investment from Apple, Microsoft, Google, Samsung and others.

Grading the group

We call out companies that are well positioned: Apple (AAPL, CL Buy, \$760PT), Facebook (FB, Buy, \$35PT), and Samsung (005930.KS, Buy, ₩1.75mn PT); those straddling the line: Amazon (AMZN, Buy, \$280PT); and companies that are challenged: Google (GOOG, Neutral, \$680PT), Intel (INTC, Sell, \$16PT), and Microsoft (MSFT, Neutral, \$31PT) in the context of platform adoption.

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Portfolio Manager Summary

Much has been made about whether “open” or “closed” platforms will win out in today’s compute paradigm. However, we think this framework is challenging because the current compute dynamic is not this black and white and the resulting discussion is more circuitous than it is helpful. For example, while Apple is “closed” as its products are vertically integrated from a hardware and software perspective, Apple is also very much “open” as it supports a vibrant developer ecosystem to create third-party applications that run on Apple’s devices. Furthermore, in our view, the open/closed debate overlooks factors that are key to driving a platform’s long-term success, most notable of which is the importance of the ecosystem.

In this report we provide investors with a guide to navigate the new consumer compute landscape, brought about by mainstream adoption of smartphones and tablets. Our discussion is differentiated in that we use the concept of two-sided markets to frame our view, support our work with a survey of more than 1K mobile users, and draw conclusions on key industry participants.

We distill our analysis into four key takeaways:

- 1. Survey of 1K+ mobile device users suggests ecosystems drive platform stickiness, thus leading to a slow decline in Android smartphone share starting in 2013.**
- 2. Vendor share of tablets and smartphones is likely to converge over time, helping to solidify Apple’s ecosystem dominance.**
- 3. Market disruption related to HTML5, the forthcoming version of the standard web programming language that delivers greatly improved audio and video streaming, is at least 3-5 years out, meaning ecosystem importance will only get stronger.**
- 4. TV, and its integration with mobile device ecosystems, could be the battleground for the next compute revolution, and its ability to become another anchor platform component will likely mean significant investment from the competition.**

We call out companies that are well positioned: Apple (AAPL, CL Buy, \$760 price target), Facebook (FB, Buy, \$35 price target), and Samsung (005930.KS, Buy, ₩1.75mn price target); those straddling the line: Amazon (AMZN, Buy, \$280 price target); and companies that are challenged: Google (GOOG, Neutral, \$680 price target), Intel (INTC, Sell, \$16 price target), and Microsoft (MSFT, Neutral, \$31 price target) in the context of platform adoption.

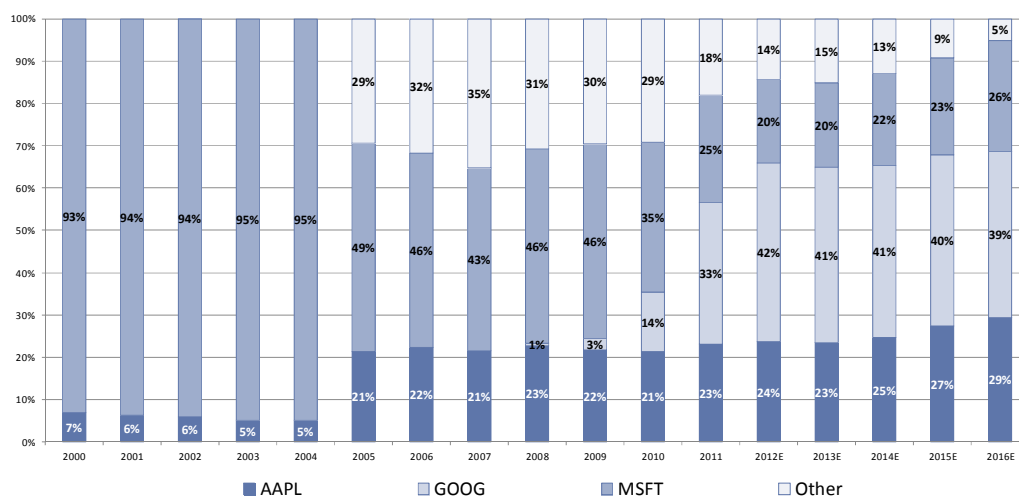
In aggregate, these companies have over \$250bn in net cash, and given the high stakes, we believe it is possible for all (especially the laggards), to deploy their balance sheets whether for device subsidies in an effort to increase compute market share, acquisition of content, M&A (as did Google did in the case of Motorola Mobility), or in some cases capex for a broad-based fiber build-out to help position for the disruption we expect to occur in TVs. Put another way, we think that the companies that are not well positioned for the future will draw a line in the sand that could negatively impact their cash flow and operating margins looking out over the next several years as they seek to preserve or improve their market relevance.

How we got here

The compute landscape has undergone a dramatic transformation over the last decade with consumers responsible for the massive market realignment. While PCs were the primary internet connected device in 2000 (139mn shipped that year), today they represent just 29% of all internet connected devices (1.2bn devices to ship in 2012), while smartphones and tablets comprise 66% of the total. Further, although Microsoft was the leading OS provider for compute devices in 2000 at 97% share, today the consumer compute market (1.07bn devices) is led by Android at 42% share, followed by Apple at 24%, Microsoft at 20% and other vendors at 14%. See Exhibit 1.

Exhibit 1: Vendor share of consumer compute, 2000-2016E

Shift from single-vendor dominance (MSFT) to multiple vendors (AAPL, GOOG, MSFT, Other)



Source: IDC, Goldman Sachs Research.

Introducing the concept of a two-sided market

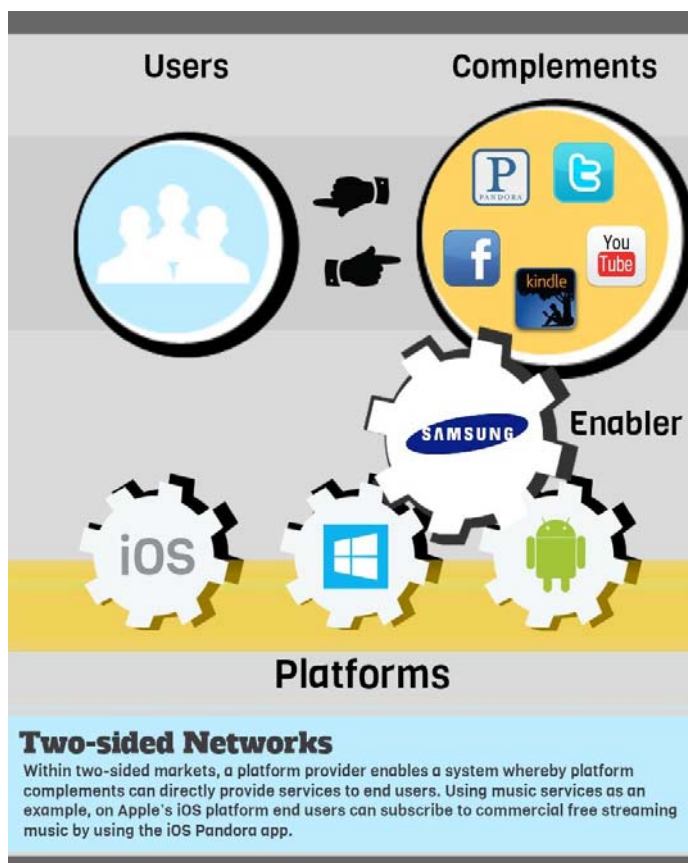
Instead of trying to determine platform winners/ losers by considering whether the platform is “open” or “closed,” we think the concept of two-sided markets is a more helpful theoretical framework within which the topic can be debated.

In a two-sided market, a company creates a platform that enables other companies (the first side of the market) to sell their products and services to platform users (the second side of the market). Accordingly, the platform is the foundation that enables the market to exist (examples of platforms include Apple’s iOS or Google’s Android) while the complements are the products or services that sit on top of the platform and are utilized by the end user (examples of complements include Facebook or the Amazon Kindle Reading App). Clearly, this type of market possesses cross-side network effects, meaning the more users a platform attracts, the more complements are created, which in turn brings more users. See Exhibit 2.

In our view, there are only a handful of meaningful platform providers in the consumer compute space today, though there are numerous complement providers (essentially any entity that offers an app, either native for a platform or browser-based, is a complement). That being said, this report is focused on the largest platform providers and key complement providers. Though we acknowledge that there are many other companies that are relevant to this discussion such as eBay, who as with Amazon benefits from device

proliferation as it gives consumers more opportunities to leverage the site, as well as complements such as Yelp, Pandora and Netflix, just to name a few.

Exhibit 2: Two-sided markets illustrated



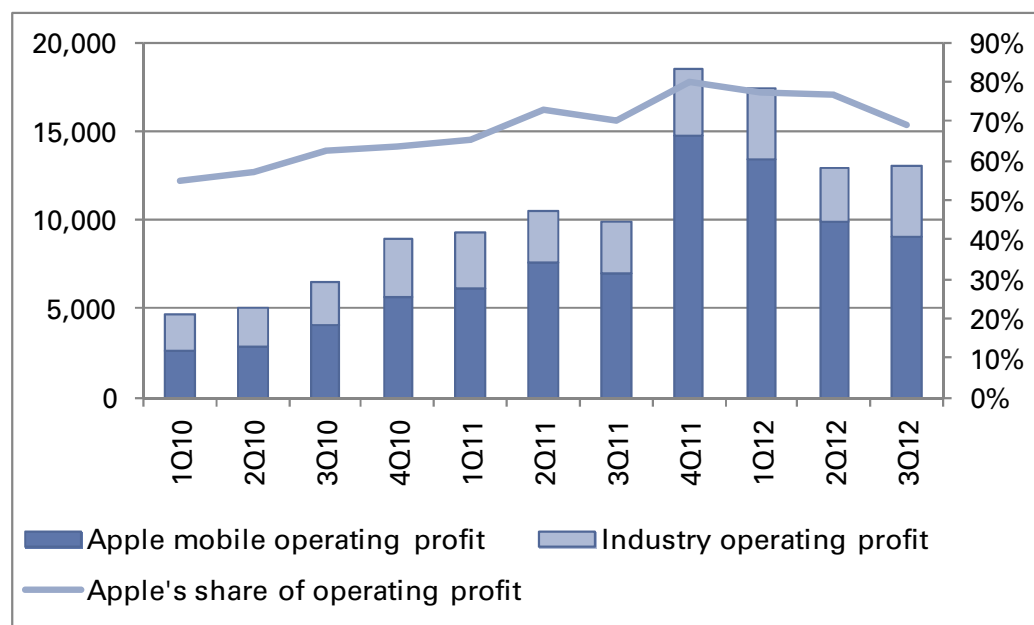
Source: Goldman Sachs Research.

To the victor go the spoils, or in this case, profits

Users and complements are basic requirements in a platform battle, but the true measure of success is ultimately profitability. Quality of users matters. As discussed in the next section, Apple customers have shown more willingness to pay for complements than Android users. Further, despite growing competition, the power of Apple's iOS platform also remains significant in operating profits on devices. Over the last ten quarters Apple has grown its share of mobile operating profits (from both tablets and smartphone device sales) from around 55% to nearly 70% based on Goldman Sachs estimates. While we would note that, with the exception of Motorola, Google does not capture any of the Android OEMs revenue as it provides the Android OS free of charge, the company monetizes the shift to mobile through online search.

Exhibit 3: Apple's share of mobile device industry operating profits

Combined tablet and phone data, \$mn



Source: Company data, IDC, Goldman Sachs Research estimates.

As a result of the low barriers to entry for app developers to create content for multiple ecosystems, we think unit and profit share of the platform market will more closely resemble the online search market, supporting multiple vendors versus the single vendor dominance exemplified during the PC era. For example, GOOG currently has 65-70% share, Baidu has around 10% share, Yahoo has 6% share, and Microsoft has 3%, whereas MSFT had 97% share of total PCs in 2000. The challenge to overcome, however, is that in the area of search, Google currently enjoys 85-90% of the industry's worldwide operating profits while company's such as Microsoft sustained an operating loss of \$2.4bn for its online services division in its FY ending June 2012.

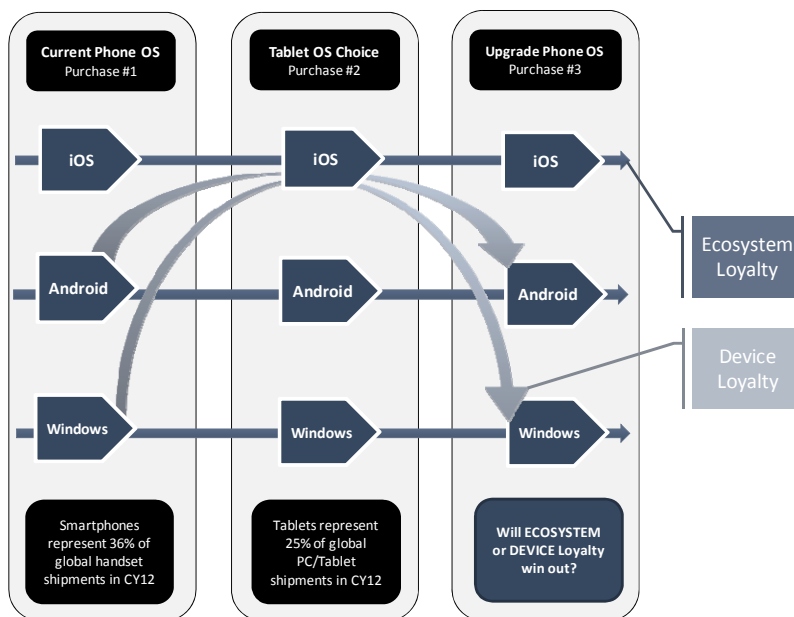
The cost of developing related applications (i.e., complements) for multiple platforms is much lower today than it was historically. For example, during the PC era, we estimate that the cost of developing an app for a second OS cost 80-90% as much as it did to develop the same application for the first OS. The primary reason for this was the development tools used at that time, as well as the fact that applications created then were created for the client server era. Essentially, the ability to re-use code that a developer had already written was limited given it was very platform-specific. This is why developers stopped writing apps for the Mac OS in the late 1990s, as they could target 90%+ of compute devices by writing to Microsoft, while the cost of porting these applications to Apple's OS was not worth the additional user reach. Fast forward to today's mobile landscape of smartphones and tablets, and to the fact that most apps are essentially web apps with a native front end (leveraging web standards such as HTML) and the ability to port these apps to multiple platforms becomes much easier to navigate, as essentially only the front end needs to change. As such, the cost of developing applications for multiple operating systems is a small fraction of the cost of the original app development costs. This means that complement developers have significant incentives to develop their applications for multiple operating systems.

Expect convergence over time

Our survey of 1K mobile device users revealed that individuals who own both a tablet and a smartphone spend 2.4X on content (apps, music, books, video, etc) than individuals who only own a smartphone. Of note, Apple customers in particular have shown more willingness to pay for complements than Android users. According to our survey, respondents who owned both an iPhone and iPad spent a third more on complements than respondents who owned both an Android phone and Android tablet.

We also learned that the vast majority (or 86%) of mobile device users view the device ecosystem as important to their device purchasing decisions. Accordingly, as tablet penetration increases (68% of the individuals we surveyed owned both a tablet and a smartphone) we think the tablet will move into more of an anchor position, and will have increasing levels of influence on future smartphone purchases.

Exhibit 4: User will choose between ecosystem loyalty and device loyalty



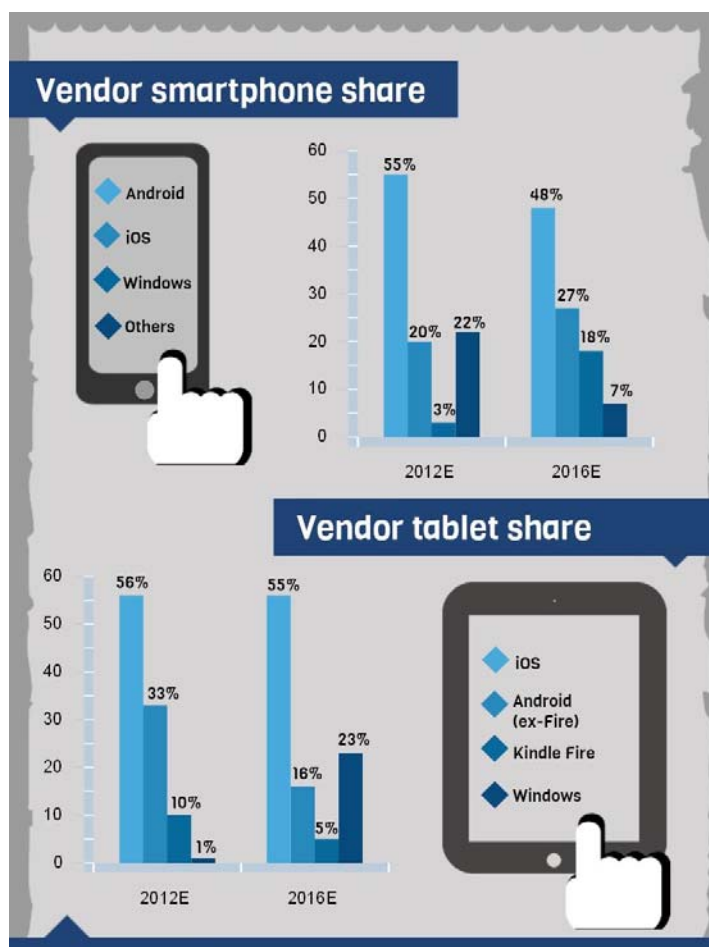
Source: Goldman Sachs Research.

By having both devices as part of the same ecosystem, consumers will be able to truly leverage the ecosystem as content migrates seamlessly between devices. We offer three key takeaways from this observation:

- 1) If left without a meaningful competitor in tablets, we believe Apple's dominant share of tablets will act as an anchor that pulls its smartphone share (estimated at 18% in CY13) steadily upward over time.
- 2) A credible tablet becomes a strategic imperative for Google or it runs the risk of platform defection resulting in a steady decline of Android smartphone share (estimated to be 55% in 2012) starting in CY13. While we are modeling 48% smartphone share for the Android in 2016, we note this number could prove optimistic in the absence of a compelling standalone Android-based tablet to solidify the ecosystem. This is especially so given we expect Android to hold just 16% tablet share by 2016 excluding Kindle Fire (21% including the Kindle Fire), and our survey results suggest consumers want their media and apps to interoperate across their devices.

- 3) Microsoft faces an uphill battle (though not insurmountable) given it lacks meaningful share in either tablets or smartphones and as such will need to rely on its appeal to knowledge workers to help drive adoption as its complement ecosystem will remain behind the iOS and Android platforms at least over the next 6-12 months.

While we would expect operating system share convergence to occur in developed markets, there have been some concerns that ecosystem stickiness will be less robust in emerging markets. Furthermore, carriers in emerging markets have shown fewer propensities to subsidize smartphones given the low availability of consumer credit histories and generally lower ARPU. Nevertheless, this may all be changing. Apple, for instance, has a robust and growing user base for its App Store in regions such as Greater China, and the company is fostering adoption by enabling and encouraging local developers to contribute domestic app content. In addition, iCloud is also available in China and other emerging regions, enabling multi-device management and content sharing for iOS devices. While iTunes media content has not been available in most emerging regions, limiting a key source of ecosystem complements, this may also be changing. Indeed, on December 4, Apple announced that it was opening the iTunes music store in Russia, Turkey, India, South Africa, and 52 other countries. This strengthening ecosystem presence in emerging regions is not only introducing the switching costs for consumer devices in these countries (a rare historical phenomenon), but it is also making emerging market carriers more likely to subsidize devices due to increased customer loyalty and heavier data consumption that drives much higher ARPU. Other platform vendors are building ecosystems in emerging regions as well, so it is only a matter of time before the platform battle moves beyond the developed regions.

Exhibit 5: Vendor share of smartphones and tablets will converge over time

Source: Goldman Sachs Research.

Potential market disruptors

HTML5 still a ways off

Despite benefits for consumers and developers, mainstream adoption of HTML5 is likely three to five years away. For consumers, the benefit would be that they could select services and devices independently of each other, and developers could connect directly with consumers without paying a distribution fee to app stores.

Essentially, broad adoption of HTML5 as a standard could break the platform model that is prevalent today by giving consumers access to high quality music or video content from any device through any browser, rather than relying on a platform specific application such as iTunes. As such, it offers the chance for market disruption over time as the value of ecosystems and the consumer lock-in they create could potentially prove to be less valuable. In a scenario where HTML5 becomes a broad based reality, Google could likely move into the camp of beneficiaries, as it would be able to leverage its Chrome browser to direct users to its online offerings, such as Google Play, which are already device agnostic. As well, increased marketing and distribution of the Chrome browser would likely increase Google's share of TAC-free mobile search. A world of HTML5 would also move Amazon from the straddling the line camp to winner as it would then be able to offer a more frictionless consumer experience for its array of complement applications such as its Kindle and Instant Video apps and abandon its hardware strategy, helping to drive margins

higher. In either an HTML5 based or ecosystem/app based world, we continue to view Facebook as the ultimate complement.

Smart TVs as the next battleground

We see the television as the next potential catalyst for disrupting current market dynamics, just as the advent of smartphones and tablets has created new category leaders and put Microsoft and Intel's relevance at risk. Given consumer cloud platforms largely center around media consumption, in our view the television is a natural extension of these platforms giving complements another device on which to deliver their services.

In our view, the television is an attractive target for several reasons:

1. It carries a higher purchase price than a smartphone, with average 46-inch set costing roughly 3X the average wholesale price of smartphone.
2. The replacement cycle for televisions at around eight years is roughly 4X that of a smartphone. While this does push out revenue, in our view it also creates the potential for competitive disruption as we believe consumers will match the platform of their more frequently purchased smartphones and tablets to the television they already own. The television effectively raises the consumer's cost to switch platforms.
3. As a shared device the television has the potential to impact the platform choice of an entire household rather than a single individual.

For these reasons, we expect Apple, Google, Microsoft and Samsung will focus intently on the connected viewing experience while Facebook will continue to serve as the ultimate complement given its user base. In fact, we have seen signs of early disruption in the \$110bn worldwide television market through set-top box-like devices such as Apple TV, Google TV, Roku boxes and through streaming video services on Microsoft's Xbox gaming console. In fact, we would expect the launch of Xbox720 in 2H13 to take gaming and streaming content to another level and for online communication to be enhanced by leveraging assets acquired by Skype. Further, we view the potential for technology companies to partner with cable companies on a more intuitive more user-friendly customer interface, or viewing guide, as another potential source of disruption. That said, cable companies differ on their view regarding partnering with technology companies, given the risk of surrendering the viewer relationship.

Competing in television is not without risks.

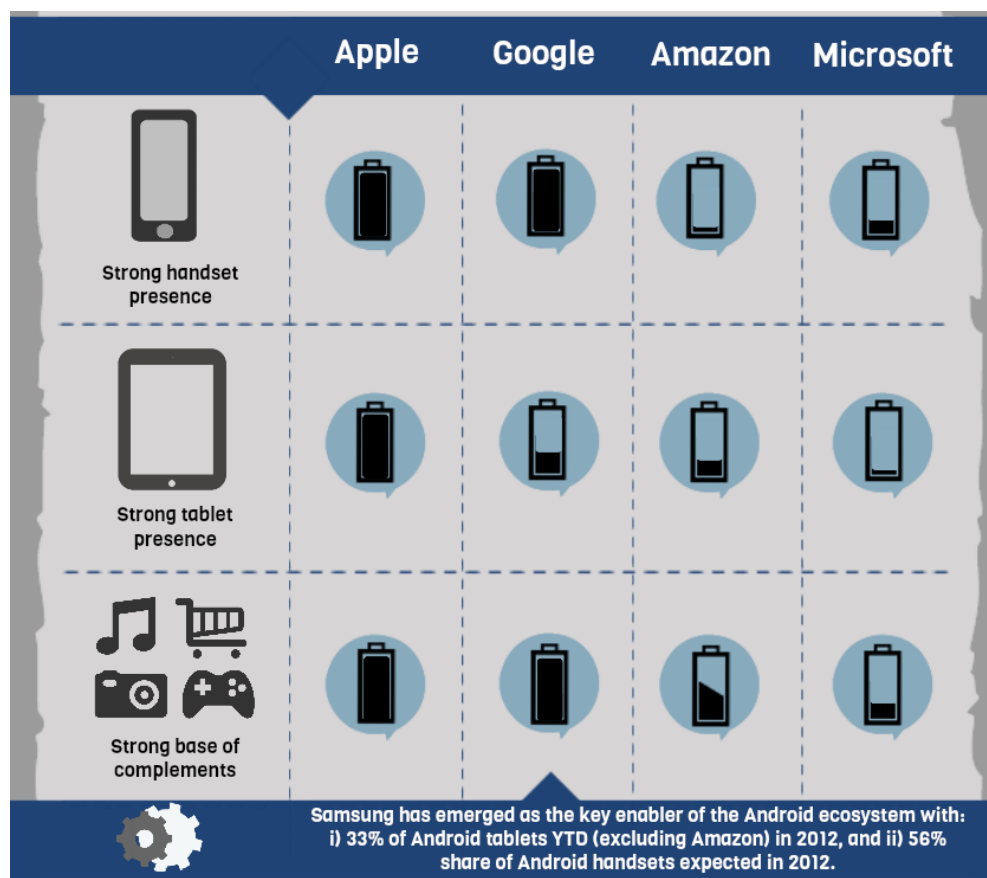
- Television hardware is a challenging business with low-single-digit margins, heavy inventory risk, and rapidly commoditizing technology.
- On the content side, the cable bundle is deeply entrenched given how its economics highly favor the networks, making it difficult to offer consumers attractive a la carte pricing.

With so much at stake, we would expect the ecosystem vendors to spend aggressively in the areas of opex and capex to try and be first to redefine the TV market. The potential for consumer lock-in that the television creates will likely drive platform companies to continue exploring the space. As such, while the battle is just getting started on this front, we see it as having the potential to either further entrench current winners such as Apple, or completely disrupt the market once again.

Key vendor implications

Our key company takeaways and associated framework for looking at two-sided markets is as follow:

Exhibit 6: Ecosystem comparison



Source: Goldman Sachs Research.

Beneficiaries: Apple, Facebook, Samsung

Apple should continue to gain share in phones, and its tablet share may be more resilient than most expect. Apple has linked and leveraged its success from iPod, iPhone and iPad with an expanding list of complements that includes music, movies, TV shows, apps, and iCloud. The company's customers have shown more willingness to pay for complements, which has made them a more attractive platform for complement providers and has continued to attract more users. With the results of our survey showing that spending on complements is rising and that Apple continues to lead the pack, we believe loyalty to the company's ecosystem is only increasing and this should translate into continued growth going forward. In particular, we see the potential for Apple to capture additional growth as existing iOS users move to multiple device ownership and as the company penetrates emerging regions with new devices such as the iPad mini and lower priced iPhones. As a result, we believe Apple's market share in phones has room to rise much further, and that its dominant tablet market share appears to be more resilient than most expect. We expect these factors to continue to drive the stock higher.

Facebook is one of a few companies for which the shift to mobile brings better pricing and is margin accretive. We view the rise of smartphones and tablets as a tailwind to the company's core ad business as mobile Sponsored Stories in news feed monetize at 40X the CPM of typical right rail ads, while carrying comparable costs in absolute dollar terms. Looking out to 2013, we see Sponsored Stories as well as new offerings such as Gifts and Offers, both on mobile and the desktop, potentially contributing \$2bn or more to the company's top line, which even with some cannibalization of right rail spending will help reaccelerate ad revenue growth in our view. With more than 1bn users, Facebook is the ultimate complement. Although the stock is still off considerably from its IPO price, we see recent outperformance as continuing into 2013 as the market starts to fully appreciate its ability to monetize mobile and our view that they are a key local enabler.

Samsung Electronics is well positioned to maintain its position as the leading Android device maker and support other open platforms, such as Windows 8, given unmatched scale, vertical integration (especially in displays and semiconductors), hardware differentiation, and short design lead times. We estimate Samsung Electronics' smartphone market share in the US at around 20% but over 35% in the rest of the world as of end 2012. Over the mid-term we believe that Samsung's strategy is based more on device proliferation and, as such, the company is operating system and platform agnostic. Device proliferation delivers two benefits for the company: (1) from selling the hardware device; and (2) capturing a greater portion of smartphone and tablet bill of material (BoM). At this time, Samsung Electronics has the potential to address around 40-45% of mobile BoM. If Samsung Electronics is able to integrate additional functionality such as baseband/connectivity the company may be able to position itself to capture over 70% of smartphone and tablet BoM.

Straddling the line: Amazon

Ultimately, the big benefit to Amazon in the new compute landscape is related to the fact that consumers can transact with Amazon on a continuous basis through their internet-connected devices. However, we think the company needs to find an avenue to remain as dominant in digital media as it has been in physical since it is unlikely in our view that the company can successfully establish itself as the fourth consumer compute platform. In order to try and accomplish this, the Kindle Fire was launched a year ago. Taking this a step further, given the value consumers place on ecosystems, we would not be surprised to see the introduction of an Amazon branded phone in early 2013. However, we believe the launch of a phone could put pressure on the stock near-term given the potential for margin dilution. While its ability to become a meaningful platform provider is still very much a question, Amazon is well positioned to benefit as a complement provider.

Challenged: Google, Microsoft

To maintain Android smartphone dominance, a successful Android-based tablet strategy is an imperative for Google. The dominant company in internet search, Google confronts a threat to pricing and margins in the shift to mobile. While the company's Android operating system represented more than 70% of smartphone shipments in 3Q12, iOS still generates more than 60% of mobile internet traffic, and Google pays TAC rates on iOS devices that we estimate are north of 75% to be the default search provider. Further, smartphone search CPCs stand at about 30-50% of those on the desktop. The larger danger for Google in our view, is that tablet share loss leads to smartphone share defection as consumers choose to standardize on a platform, which would expose the company to a rising portion of mobile searches subject to higher TAC rates and highlights the importance of a compelling tablet offering to Google. We see Android tablet share excluding the Kindle Fire going from 33% this year to 21% next year. We also see Android smartphone share

declining next year to 53% from 55% this year. Lastly, we expect the company to make large investments with perceived higher risk down the road as it searches for a way to penetrate the living room, with Google Fiber as a potential enabler. We continue to believe the company's operating margins are likely to face pressure over the next few years. While we believe the investments the company could make over the next few years could cause shareholder concern, we ultimately see Google as trying to find a way to stay just as relevant in the new compute paradigm as it was during Web 1.0 and 2.0.

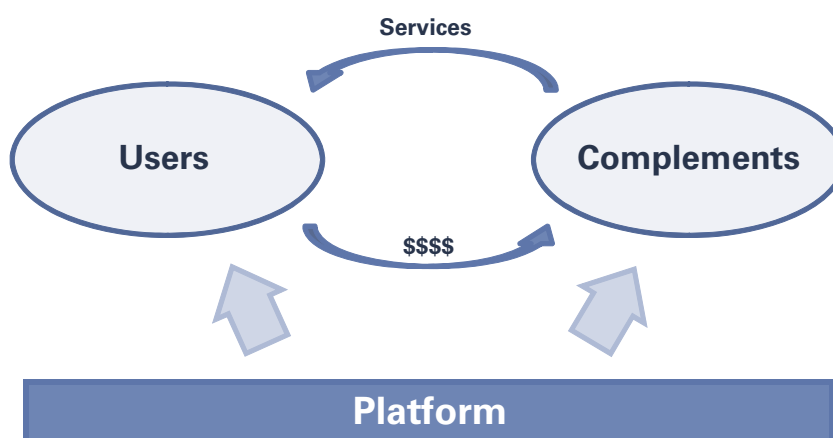
Microsoft faces a critical period of adoption in 2013 as it seeks to reverse its market share losses in total compute. After watching its market share of total consumer compute fall from 93% in 2000 to 20% expected in 2012, we expect the recent launches of Windows Phone 8 and Windows 8 tablets to help the company reclaim some share in coming years. This transition is particularly meaningful given the Goldman Sachs view of the health of the consumer PC market, which we forecast will be flat in 2013. Of note, we estimate that Microsoft would have to sell roughly 5 Windows Phones or roughly two Windows 8 RT tablets to offset the loss of one traditional Windows PC sale, which we estimate has an overall blended selling price of \$60 for business and consumer. With 2013 being a critical period of adoption for the company, we expect the shares to stay relatively range bound near-term, and then, based on the adoption of its new compute SKUs, we would expect heightened volatility post a conclusion on whether Microsoft will be a true competitive platform to current compute leader Apple.

We believe the ongoing share shift in consumer computing toward smartphones and tablets and away from traditional PCs will be negative for Intel. While Intel has over 90% market share in processors for traditional PC clients, it has *de minimis* share in tablets and smartphones. We expect Intel to have difficulty gaining share in smartphones and tablets given that: (1) Leading mobile device vendors such as Apple and Samsung design their own processors, which limits Intel's opportunity; (2) In cases where merchant chips are used, we expect ARM chips from companies such as Qualcomm to generally win as a result of the low-power characteristics of the ARM architecture, well-established relationships between ARM vendors and mobile hardware companies, and in some cases more experience by the ARM chip companies with connectivity.

Two-sided markets: A handy theoretical framework

In thinking about the current competition among the largest names in technology to become the dominant ecosystem for providing consumers with seamless media consumption and social communication across multiple screens, the economic concept of two-sided markets is a handy theoretical framework (see Exhibit 7). Within two-sided markets, a platform provider enables a system whereby platform complements can directly provide services to end users. Using music services as an example, on Apple's iOS platform end users can subscribe to commercial free streaming music by using the iOS Pandora app. Similarly, Facebook users can use Spotify's paid subscription offering to stream all the music in Spotify's library. In this section, we outline key dynamics of two-side markets, including cross-side network effects, the impact of subsidies, and the importance of customer segmentation.

Exhibit 7: Market structure of two-sided networks



Source: Goldman Sachs Research.

The virtuous cycle: More users mean more complements, which means more users, which means more complements...

Typically, platform users prize a wide breadth of choice in the offerings available on a given platform. Again using music as an example, iOS users are likely to place a high value on the ability to not only access their iTunes libraries on their devices, but also the availability of Spotify, Pandora, and other music services. In short, the more platform complements there are, the more attractive the platform offering is to end users. Similarly, for platform complements, which in the four-screen ecosystem (in which users consume content on PCs, phones, tablets and TVs) include both app developers and content providers, more end users, or potential consumers, make a given platform more appealing. Economists call this concept "cross-side network effects", and it clearly applies to the four-screen consumer cloud.

Make the platform free for one side, so the other side will pay

Platforms usually need to subsidize one side of the market to gain adoption and start the virtuous cycle of cross-side network effects. Within two-sided networks, usually one side has a greater willingness to pay than the other. The most current examples of this are

Google Search and Facebook. Both companies provide their service free of charge to end users, while charging advertisers for access to those end users. Another classic example of this in tech history is Adobe and Acrobat. Adobe made the Acrobat Reader free to consumers, which let them read PDF documents, in order to expand the market for Acrobat Pro, which enables complements to produce PDF documents. The business principle at work here is determining which side is the “money side”, i.e., which side has the greater willingness to pay, and subsidizing the other side to encourage market growth. In the current consumer cloud ecosystem, we can see this principle at work in Google providing its Android operating system to OEMs for free, in order to gain consumer adoption of smart phones.

When platforms compete, it's a race for users ... except when it's not

Given the cross-side network effects that come into play with any two-sided market, it would seem clear that, strategically, a platform that can accumulate more users at a faster rate would be in an advantaged position. However, just as it is important for platform providers to determine whether end users or complements are the “money side”, platforms must also analyze if customers can be segmented with regard to price discrimination.

As an example, there are more than 500mn Android phone users and 700K Google Play Apps which have been downloaded 20bn times. This compares with roughly 200mn iPhone users, 750K iPhone and iPad apps, and 35bn downloads. Based solely on the number of end users and complements, one could argue that Google has meaningfully narrowed Apple's lead, or perhaps even overtaken it. However, users and complements are basic requirements in a wider platform competition, and the true measure of success is monetization and ultimately, profitability. To this end, Apple reported during its 4QFY12 results call that it has paid out a cumulative \$6.5bn to app developers since the launch of its App Store in 2008. Similarly, during Google's 3Q12 call management announced the company's annualized mobile revenue run rate (including ads and the gross merchandise volume of apps and Google Play media) was \$8bn for the quarter. Assuming Google's mobile ad revenue slightly more than doubled in the past year to a \$5.5bn run rate, this implies roughly \$2.5bn in annualized app and media sales for the September quarter.

Different companies, different monetization strategies

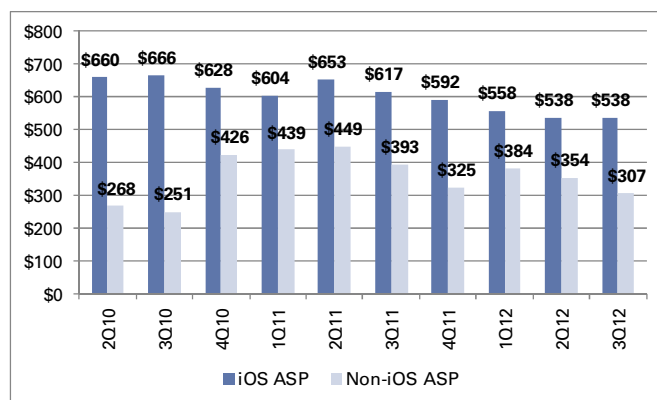
- **Tax collectors:** This monetization strategy simply means keeping a piece of every transaction on the platform. For example, Apple keeps 30% of every app sale in the AppStore. iTunes also falls in this category, along with the Google Play store, Amazon's Kindle Store and Cloud Player service, and Facebook's app platform.
- **Alternative funding:** Companies using this strategy typically provide their service to end users free of charge while leveraging that user base to support an alternate form of funding, typically advertising. For example, Google offers its search engine and Facebook offers its social network to internet users for free and fund their operations by charging for advertising on their websites.
- **The X way out:** In the prior two examples, it is worth noting that the platform provider effectively only monetizes one side of transactions on the platform, typically complements. As an alternative, platforms could charge end users a platform usage fee. It could be argued that the premium iOS devices carry over other smart phones and tablets is actually an iOS platform usage fee. In effect, Apple monetizes both sides of transactions on its platform. It is interesting to note, however, that while Apple's customers have also shown more willingness to pay for complements, Apple's stated goal is to manage the complements side of the business to breakeven. In fact,

hardware is the primary source of monetization and profits for Apple, and the company has paid \$6.5 billion to developers (complement providers), which has enabled it to attract complement providers to its platform.

Customer segmentation is the key to profitability

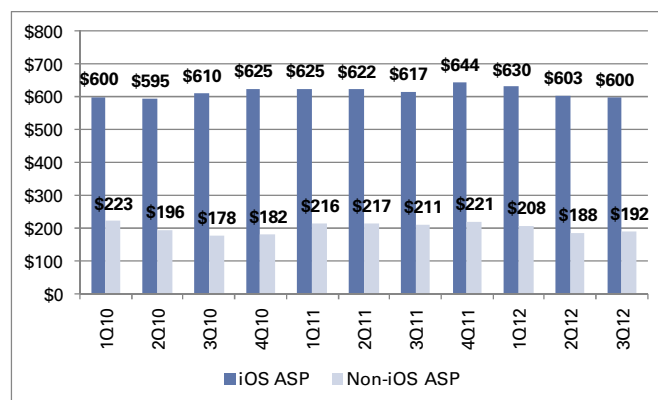
Apple customers have shown more willingness to pay for complements than Android users. This in turn makes iOS a more attractive platform for complement providers and this eventually attracts more users. The loyalty and quality of Apple's user base, driven by its platform strength, enable it to command subsidies for the iPhone from the carriers in the form of a hefty wholesale average sales price (ASP). This platform strength also supports higher retail prices for iPad. As shown in Exhibits 8-9, Apple's tablet ASPs remain roughly 1.5X the rest of the industry and its wholesale phone ASPs are nearly 3X those of the rest of the industry. That said, while Apple still possesses a first-mover advantage, the company is not without increasing competition. For example, Goldman Sachs Asia technology analyst Michael Bang expects Samsung Electronics to ship some 80mn high-end smartphones (\$600+ wholesale ASP) in 2012, which compares to Goldman Sachs hardware analyst Bill Shope's forecast of 136mn iPhone shipments in CY2012.

Exhibit 8: iOS versus non-iOS tablet ASPs



Source: IDC, Goldman Sachs Research estimates.

Exhibit 9: iOS versus non-iOS smart phone ASPs

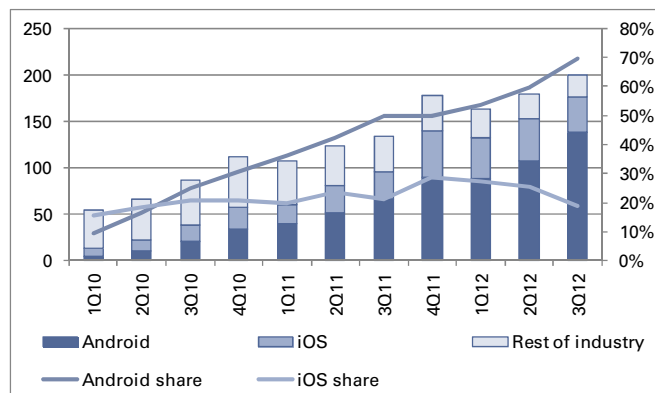


Source: IDC, Goldman Sachs Research estimates.

Despite growing competition, the power of Apple's iOS platform remains significant. As shown in the exhibits below, despite the very rapid growth in tablet and smart phone maker unit shipment share, these OEMs combined were only able to overtake Apple in total mobile revenue in 3Q12. Combined unit shipments of tablets and phones using the Android operating system have risen from roughly 10% of shipments in 1Q10 to nearly 70% in 3Q12, compared to Apple's just under 20% share of shipments. As of 3Q12, Apple had captured just over 40% of total mobile device revenue, compared to the Android OEMs at roughly 50% according to IDC. Lastly, we would note that, with the exception of Motorola, Google does not capture any of the Android OEMs revenue as it provides the Android OS free of charge.

Exhibit 10: Mobile unit shipments and share by OS

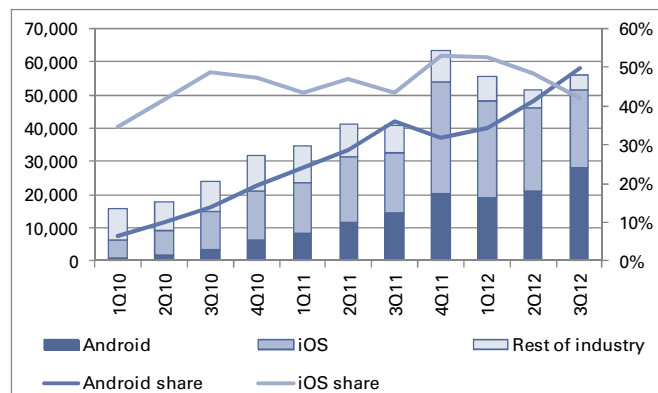
Combined tablet and phone data, millions of units



Source: IDC, Goldman Sachs Research estimates.

Exhibit 11: Mobile device revenue and share by OS

Combined tablet and phone data, \$mn

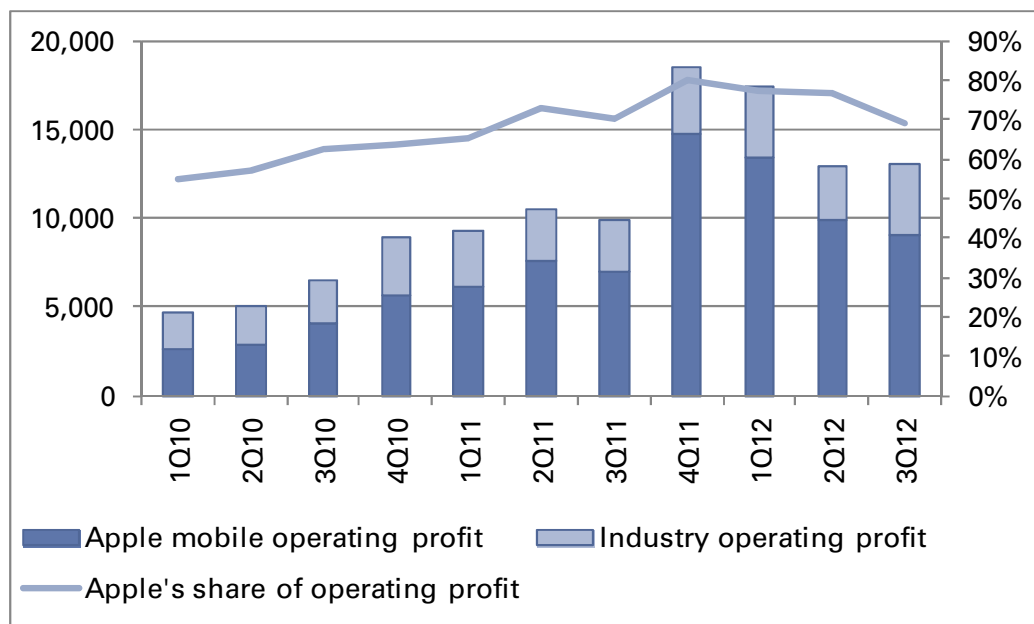


Source: IDC, Goldman Sachs Research estimates.

Given Apple's pricing power, the company takes the majority of mobile device operating profits. As shown in Exhibit 12, over the last ten quarters Apple has grown its share of mobile operating profits from around 55% to nearly 80%. We based our aggregate mobile device industry operating profits on Goldman Sachs Investment Research estimates of mobile segment operating profits for Apple, HTC, LG Electronics, Google's Motorola unit, Nokia, Research In Motion, and Samsung Electronics. It should be noted that this analysis understates Apple's share of operating profit for the narrower smart phone and tablet market as the mobile units for its competitors include feature phones.

Exhibit 12: Apple's share of mobile device industry operating profits

Combined tablet and phone data, \$mn



Source: Company data, IDC, Goldman Sachs Research estimates.

Apple customers also spend more on media and apps for their mobile devices, with Amazon Kindle Fire users also showing a high propensity for consumption. In

September 2012, we surveyed over 1,000 US smart phone owners, 682 of which also owned tablets, on their mobile consumption habits. Highlights of our survey results follow.

- As shown in Exhibit 13, among the 19 different combinations of smart phone and tablet types, the seven combinations that spent more than \$100 on ebooks, music, videos and apps in the past 12 months were either iPad or Kindle Fire owners.
- Further, respondents who owned both an iPhone and iPad accounted for some 27% of total smart phone and tablet owners in our survey, and they spent an average of \$122 on media apps (defined as books, movies, music and apps) in the last 12 months.
- Respondents who own a Blackberry and iPad spent \$126, slightly more than the iPhone iPad combination. That said, this ownership combination accounted for less than 4% of responses and thus is subject to sampling error. Moreover, given the relative lack of media and apps available for Blackberries, we would expect that the majority of this group's spend occurs on the iPad.
- Interestingly, the second-largest proportion of respondents at 18% owned an Android phone and a Kindle Fire, while their average TTM mobile spend came in at \$109.
- The Android phone and iPad combination registered 14% of responses with average spend of \$104, while the Android phone and tablet combination ranked fourth with 11% of respondents but just \$79 in average spend.

In Exhibits 13-17, we highlight that our survey respondents that spent more than \$100 on apps and media on their mobile devices in the last year, all owned either an iPad or Kindle Fire.

Exhibit 13: TTM average consumer spend on books, music, video and apps on mobile devices

Results from proprietary Goldman Sachs survey of 1,028 consumers

Smartphone	Tablet	# of respondents	% of respondents	TTM Spend/User
Blackberry	iPad	24	3.5%	\$126
iPhone	iPad	181	26.5%	\$122
Blackberry	Kindle Fire	25	3.7%	\$122
iPhone	Kindle Fire	60	8.8%	\$117
Windows	iPad	9	1.3%	\$112
Android	Kindle Fire	124	18.2%	\$109
Android	iPad	95	13.9%	\$104
Blackberry	Android	7	1.0%	\$99
Windows	Android	10	1.5%	\$94
Android	Google Nexus 7	7	1.0%	\$93
iPhone	Android	18	2.6%	\$91
Windows	Kindle Fire	10	1.5%	\$90
Windows	Nook Color	4	0.6%	\$88
Android	Android	75	11.0%	\$79
Android	Nook Color	14	2.1%	\$70
iPhone	Blackberry	1	0.1%	\$70
Blackberry	Nook Color	7	1.0%	\$57
iPhone	Nook Color	10	1.5%	\$52
Blackberry	Google Nexus 7	1	0.1%	\$20

Source: Goldman Sachs Research.

Additionally, iPads and Kindle Fires dominate categories when one looks at users by the type of phone they use.

For example, among Android phone users:

- Kindle Fires are 39% of tablet ownership with \$109 in TTM spend.
- iPads account for 30% of tablet ownership with \$104 in TTM spend.
- Android tablets (excluding the Kindle Fire) have 24% share and \$79 in TTM spend.

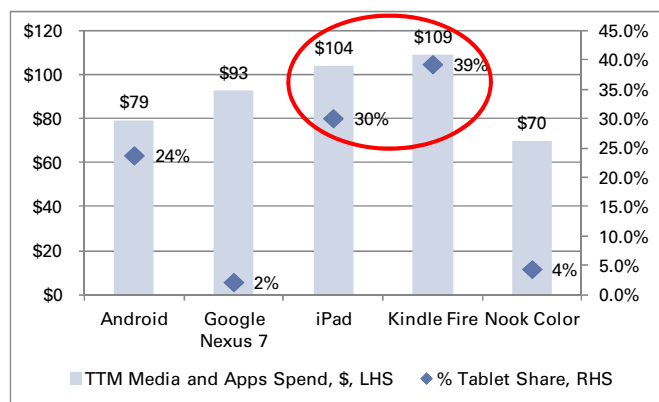
Similarly, among Blackberry users:

- Fires account for 39% of tablet ownership and \$122 in TTM spend.
- iPads represent 28% of tablet ownership, with \$126 in TTM spend.

Not surprisingly, among iPhone users:

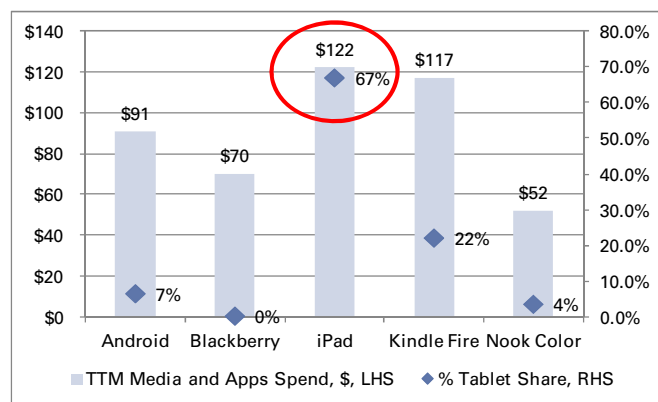
- iPads represented 67% of tablet ownership with an average spend of \$122, which in our view highlights the importance of familiarity and interoperability within the consumer cloud ecosystem.
- Fires represented 22% of tablet ownership and \$117 in average spend

Exhibit 14: Average TTM spend by tablet type and tablet share among Android phone users



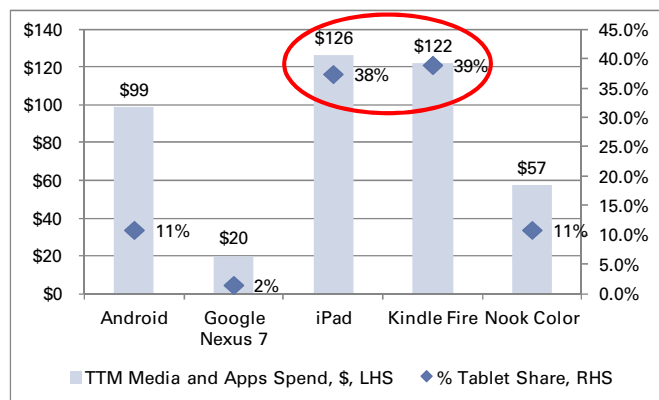
Source: Goldman Sachs Research.

Exhibit 15: Average TTM spend by tablet type and tablet share among iPhone users



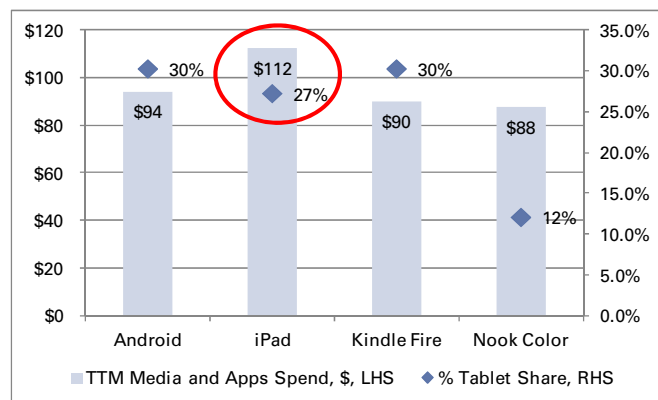
Source: Goldman Sachs Research.

Exhibit 16: Average TTM spend by tablet type and tablet share among Blackberry users



Source: Goldman Sachs Research.

Exhibit 17: Average TTM spend by tablet type and tablets share among Windows Phone users

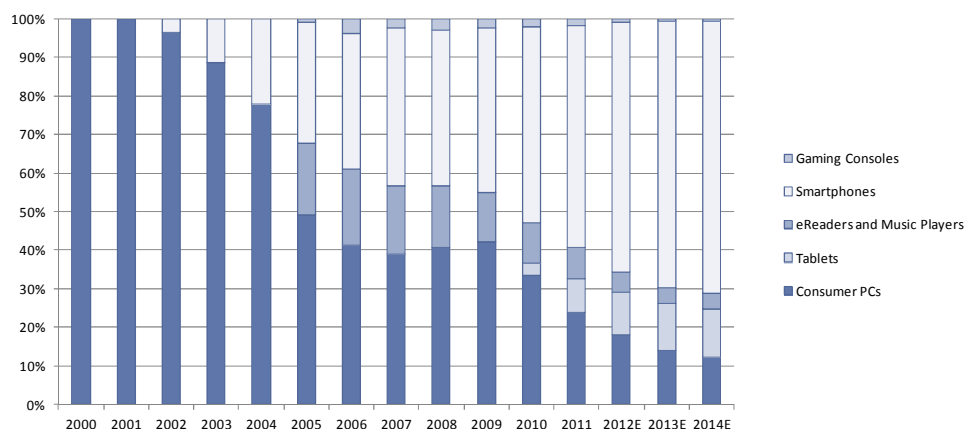


Source: Goldman Sachs Research.

The compute evolution: MSFT's fall, the rise of new leaders

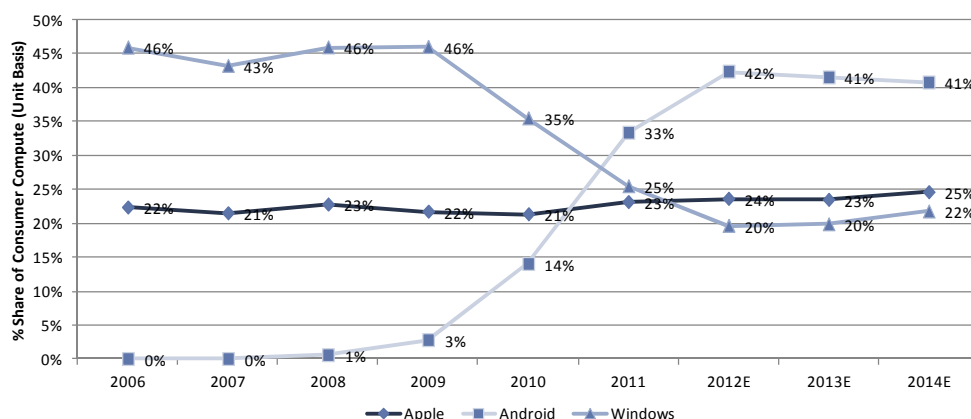
It took a compute revolution to unseat Microsoft from its dominant market position. Looking back to 2000, the primary device that connected to the Internet was a PC. In 2000, 139mn PCs were shipped worldwide, with Microsoft holding around 97% share of the total market. The majority of PCs shipped (60%) were for commercial use by businesses, educational institutions or government entities, while the remainder (40%) were for consumer use. Fast forward to today and the total number of internet connected devices (defined below) has grown significantly with around 1.2bn devices to ship during 2012, of which only around 30% or 356mn will be PCs. Furthermore, we believe that consumers are now responsible for up to 85% of compute device purchases and are increasingly influencing commercial device purchases, which is evidenced through the bring-your-own-device (or BYOD) trend in the workplace. See Exhibit 18.

Exhibit 18: Evolution of the consumer compute landscape



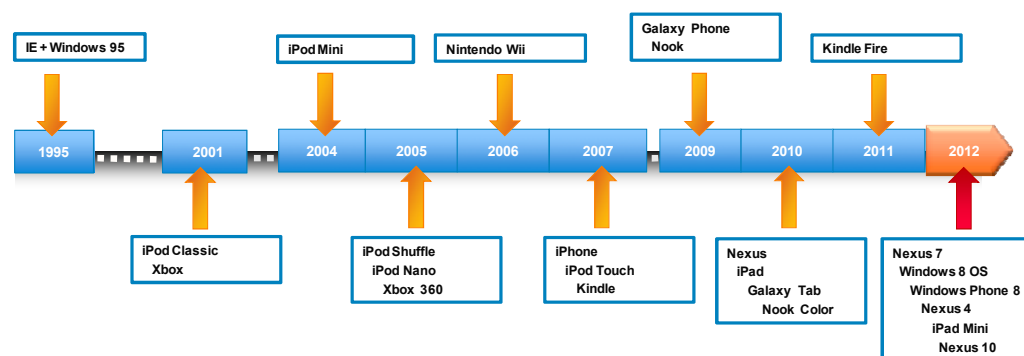
Source: IDC, Goldman Sachs Research estimates.

We define the total consumer compute device market today as including PCs, tablets, smartphones, digital readers, music devices, and internet-connected gaming consoles. This market grew at a CAGR of +28% between 2000 (56mn devices) and 2012 (1.07bn devices). That said, Microsoft's share of this market has experienced sharp declines over the same time period, moving from 93% in 2000 to an expected 20% in 2012, driven by declines in PC shipments compounded by strong growth in newer device categories, including tablets and smartphones, where Microsoft has relatively low market share. Nevertheless, we are optimistic that Microsoft will be able to regain some share in coming years assuming that adoption trends around the company's newly launched tablet and smartphone operating systems are positive (more on this below). See Exhibit 19.

Exhibit 19: Evolution of consumer compute market share by OS

Source: IDC, Goldman Sachs Research estimates.

Fundamentally, Microsoft's business was disrupted by other vendors who successfully introduced compelling new device categories. Microsoft became the market-leading provider of operating systems for client computing in the 1980s with MS-DOS, strengthening its dominance in the 1990s with the introduction of Windows. However, the introduction of new device categories starting in 2001 with the launch of the iPod (followed by the iPhone in 2007 and the iPad in 2010), which meaningfully changed the way that individuals consume and create digital content, displaced PCs from their dominant market positioning (see Exhibit 20). Although Microsoft has attempted to participate in these new markets, for example, by introducing its smartphone operating system Windows Phone in 2010 and introducing Windows 8 for tablets in 2012, the company has been a significant technology laggard relative to category pioneers including Apple, Google and Amazon.com. As such, we view the late October 2012 launches of Windows 8 and Windows Phone 8 as critical for Microsoft to expand its share of the consumer compute market.

Exhibit 20: Select compute device timeline

Source: Company data.

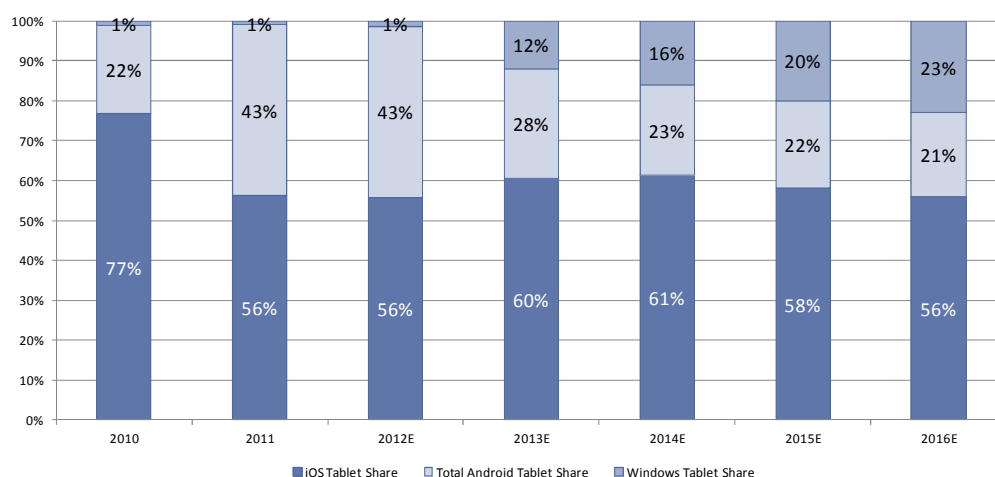
However, thus far, Microsoft has failed to establish a meaningful foothold in key growth categories. The importance of smartphones cannot be understated as these internet-connected "pocket PCs" have experienced explosive growth; 122mn smartphones shipped in 2007 (of which 4mn were iPhones) versus 693mn devices expected to ship in

2012 (136mn are estimated to be iPhones) reflecting a five-year category CAGR of 41% (106% CAGR for iPhones over the same time frame). Importantly, we believe smartphones will comprise around 65% of total consumer compute devices in 2012, progressing to 69% in 2013 and 73% in 2016.

Tablets have also enjoyed strong growth since the category was introduced in 2010, which is visible in the two-year CAGR of +148% (19.3mn devices shipped in 2010 vs. 119mn units expected to ship in 2012). We think that tablets will make up around 11% of total consumer compute devices in 2012, which will progress toward 12% in 2013 and 13% in 2016.

Importantly, we believe that Microsoft will end 2012 with 1% share of the tablet market and 3% of the smartphone market, although in 2013 we would expect Microsoft's share of the tablet market to increase to 12% (given the October 2012 release of the company's first tailored tablet OS) and Microsoft's share of the smartphone market to increase to 7% (gradual progression with Windows Phone OS). See 21- 22.

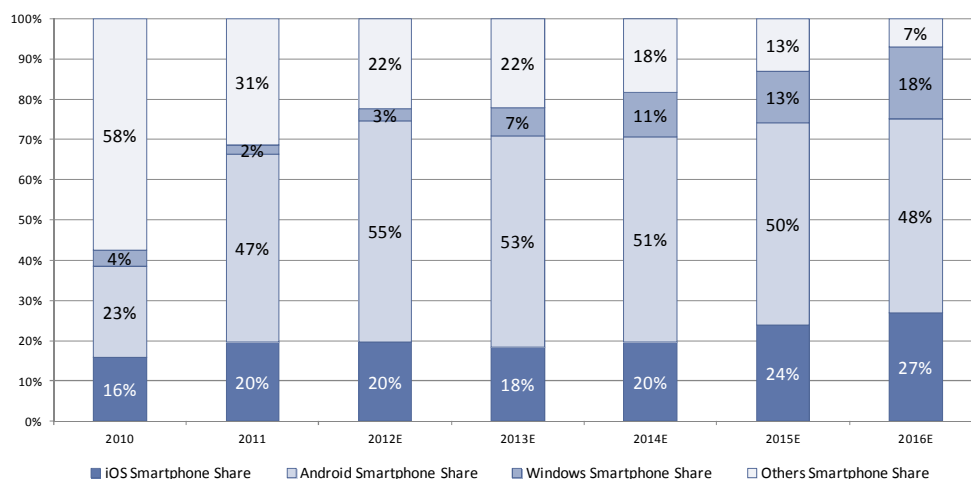
Exhibit 21: Evolution of tablet unit market share



Note: Android share includes Kindle Fire.

Source: IDC, Goldman Sachs Research estimates.

Exhibit 22: Evolution of smartphone unit market share



Source: IDC, Goldman Sachs Research estimates.

With Microsoft on the sidelines up until recently, the consumer compute OS market had come down to two key vendors: Apple with iOS and Google with Android (see Exhibit 23). Apple's strong market presence (we estimate 24% share of total consumer compute in 2012) is the result of its role as a successful pioneer of key new compute devices, including the smartphone and tablet. That having been said, as the company's software and application ecosystem is tied to its hardware devices, there was a need for an alternative cross-platform operating system to enable competitive form factors. Google met this need with the introduction of the Android operating system (open source) in November 2007, which has proliferated across smartphones in particular, but tablets as well. In fact, May 2012 data from OpenSignalMaps suggests there are more than 4K distinct devices running Android with Samsung, HTC, Sony and Motorola as key device vendors.

Accordingly, with an estimated 42% of the total consumer compute market in 2012, Google/ Android has captured the dominant position (Apple has the number-two spot at 24%, followed by Microsoft at 20% and other vendors at 14%), largely driven by Android's success in the smartphone category, where attractive device form factors have been introduced by Samsung and others. We expect Android share to tick down slightly to 41% share of total consumer compute in 2013/14 partly as Microsoft captures incremental share with Windows 8 and Windows Phone 8.

Exhibit 23: Evolution of consumer compute market share on a unit basis

	2006	2007	2008	2009	Total Devices (000s)		2012E	2013E	2014E	2015E	2016E
					2010	2011					
Total Consumer Devices											
Apple	52,087	64,153	79,029	88,714	125,489	190,023	252,679	323,170	396,590	491,238	580,204
Android	-	-	1,951	11,435	82,519	274,100	453,184	571,793	657,602	725,341	772,732
Windows	107,115	129,130	159,398	187,863	208,605	209,100	209,908	273,589	350,762	411,226	519,488
Other	74,104	105,523	106,681	120,553	171,866	148,430	154,708	209,738	208,535	167,061	100,121
Total	233,306	298,806	347,059	408,565	588,480	821,654	1,070,479	1,378,290	1,613,489	1,794,867	1,972,545
% of Total Consumer Devices											
Apple	22%	21%	23%	22%	21%	23%	24%	23%	25%	27%	29%
Android	0%	0%	1%	3%	14%	33%	42%	41%	41%	40%	39%
Windows	46%	43%	46%	46%	35%	25%	20%	20%	22%	23%	26%
Other	32%	35%	31%	30%	29%	18%	14%	15%	13%	9%	5%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
YoY Growth											
Apple	42%	23%	23%	12%	41%	51%	33%	28%	23%	24%	18%
Android	-	-	-	486%	622%	232%	65%	26%	15%	10%	7%
Windows	27%	21%	23%	18%	11%	0%	0%	30%	28%	17%	26%
Other	47%	42%	1%	13%	43%	-14%	4%	36%	-1%	-20%	-40%
Total	36%	28%	16%	18%	44%	40%	30%	29%	17%	11%	10%

Source: IDC, Goldman Sachs Research estimates.

As shown in Exhibit 24, tablets and smartphones are expected to drive growth in the total consumer compute market. Of the three platforms, we see Apple as best positioned given its strength in both segments. While Android is expected to have around 21% of the total tablet market (excluding Kindle Fire) in CY13 (as shown in Exhibit 29 on page 27), its strength lies in smartphones, where Android is expected to grow units 31% yoy and have 53% share during the same time period. For Microsoft it is very early days, given the late October 2012 launches of its new tablet and smartphone operating systems, though we think the company is well positioned to go after productivity users given its appeal to its Office user base.

Given diversification of the consumer compute market, we think it is unlikely that a single vendor will come to dominate the entire market as Microsoft had done with

client computing. We note that to date Android has captured a higher number of absolute units although Apple's ongoing product innovation, relatively higher ASPs and extensive complement ecosystem has allowed the company to capture a higher proportion of profit dollars within the ecosystem albeit at lower unit share.

Exhibit 24: Device by form factor and platform

	Total Devices (000s)					% of Total					Y/Y Growth				Contribution to Y/Y Growth			
	2010	2011	2012E	2013E	2014E	2010	2011	2012E	2013E	2014E	2011	2012E	2013E	2014E	2011	2012E	2013E	2014E
Apple % of total																		
PC	14,434	17,799	18,011	19,425	21,032	12%	9%	7%	6%	5%	23%	1%	8%	8%	3%	0%	1%	0%
Tablet	14,810	40,551	66,206	101,478	124,457	12%	21%	26%	31%	31%	174%	63%	53%	23%	21%	14%	14%	7%
iPod	48,758	38,571	32,086	27,361	26,818	39%	20%	13%	8%	7%	-21%	-17%	-15%	-2%	-8%	-3%	-2%	0%
Smartphone	47,487	93,102	136,376	174,906	224,282	38%	49%	54%	54%	57%	96%	46%	28%	28%	36%	23%	15%	15%
Total iOS devices	125,489	190,023	252,679	323,170	396,590	100%	100%	100%	100%	100%	51%	33%	28%	23%	51%	33%	28%	23%
Android % of total																		
Tablet	4,294	30,745	51,022	46,154	45,779	5%	11%	11%	8%	7%	616%	66%	-10%	-1%	32%	7%	-1%	0%
eReader	10,985	23,995	20,980	27,026	30,937	13%	9%	5%	5%	5%	118%	-13%	29%	14%	16%	-1%	1%	1%
Smartphone	67,240	219,360	381,182	498,613	580,886	81%	80%	84%	87%	88%	226%	74%	31%	17%	54%	59%	26%	14%
Total Android devices	82,519	274,100	453,184	571,793	657,602	100%	100%	100%	100%	100%	232%	65%	26%	15%	232%	65%	26%	15%
MSFT % of total																		
PC (Consumer PC only)	182,273	178,947	175,781	173,539	177,915	87%	86%	84%	63%	51%	-2%	-2%	-1%	3%	-2%	-2%	-1%	2%
Tablet	200	700	1,500	20,132	32,426	0%	0%	1%	7%	9%	250%	114%	1242%	61%	0%	0%	9%	4%
eReader (Barnes and Noble)	1,730	3,679	2,620	3,374	3,863	1%	2%	1%	1%	1%	-	-29%	29%	14%	1%	-1%	0%	0%
Smartphone	12,253	10,850	20,792	66,482	125,289	6%	5%	10%	24%	36%	-11%	92%	220%	88%	-4%	5%	22%	21%
Gaming console	12,150	14,925	9,215	10,062	11,269	6%	7%	4%	4%	3%	23%	-38%	9%	12%	1%	-3%	0%	0%
Total Windows devices	208,605	209,100	209,908	273,589	350,762	100%	100%	100%	100%	100%	0%	0%	30%	28%	0%	0%	30%	28%

Source: IDC, Goldman Sachs Research estimates.

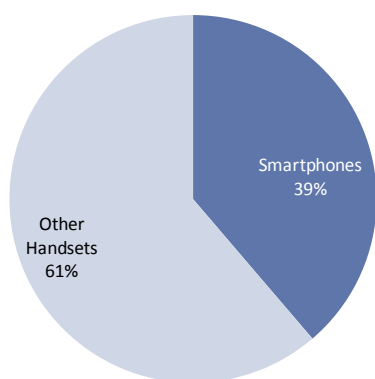
Smartphones and tablets make the platform relevant

The emergence of new device categories, namely the smartphone and the tablet, created a compute revolution that dramatically altered the total compute landscape. At this point, Apple's platform and Android-based devices are the focus; it is still early days for Microsoft.

Smartphones became top of mind with Apple's release of the iPhone in 2007, though various other vendors quickly followed suit with competitive devices. As noted by IDC, smartphone shipments outpaced PC shipments for the first time as of 4Q10, driven by favorable pricing offered by carriers and retailers as well as the proliferation of Android-based devices that offered consumers a range of choices across price points. For comparison, Goldman Sachs analyst Simona Jankowski estimates approximately 690mn smartphones will ship in 2012, which is close to 2X the number of PCs (356mn) forecast by Goldman Sachs Hardware analyst, Bill Shope, during the same time period; in 2013 950mn smartphones are expected to ship (+37% yoy), which is 2.7X the number of PC shipments (357mn, flat yoy) anticipated.

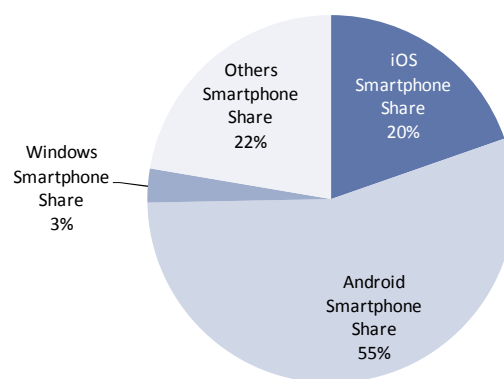
That being said, it is actually still relatively early for global smartphone adoption as these devices are expected to make up only around 39% of total handset shipments in 2012, increasing to 49% in 2013. By 2015, smartphones are expected to make up around 59% of all handsets shipped (according to Goldman Sachs Research). Of note, within the global smartphone market, Android-based devices are expected to make up 55% of the market in 2012 and 53% of the market in 2013, and to be around 50% of the market in 2015; these forecasts could prove aggressive if Android continues to falter in its quest to build meaningful tablet market share. Also, Apple is expected to have 20% share of the global smartphone market in 2012, which is expected to move to 18% in 2013, but will progress toward 24% in 2015. We believe this could prove very conservative as Apple's platform continues to strengthen and the company eventually introduces lower price points. See Exhibits 25-28.

Exhibit 25: Handset shipment breakout 2012

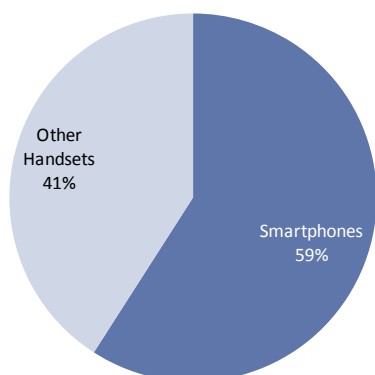


Source: Goldman Sachs Research estimates.

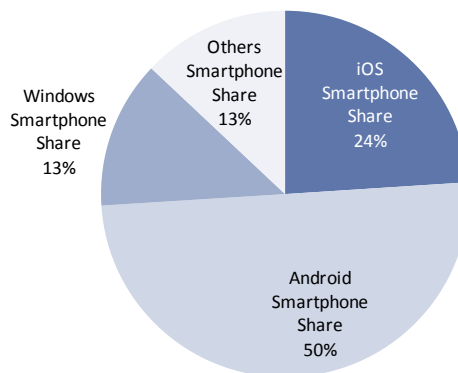
Exhibit 26: Smartphone OS share in 2012



Source: Goldman Sachs Research estimates.

Exhibit 27: Handset shipment breakout 2015

Source: Goldman Sachs Research estimates.

Exhibit 28: Smartphone OS share in 2015

Source: Goldman Sachs Research estimates.

As with smartphones, Apple broke new ground with the release of its iPad tablet in 2010. Although other vendors have introduced a range of Android-based tablets since the iPad, most notably Samsung with the Galaxy Tab (September 2010), Amazon.com with the Kindle Fire (September 2011), and Google with the Nexus 7 (June 2012), this market has largely been dominated by Apple.

Goldman Sachs estimates that 119mn tablets will ship in 2012, which is up 65% yoy versus 72mn devices shipped in 2011 and reflects a two-year CAGR of 148%; in 2013 a total of 168mn tablets are expected to ship (up 41% yoy), which reflects a three-year CAGR of 106%. Within this market, iPad share is expected to move from 56% in 2012 to 60% in 2013 and to 56% in 2016, while Android will move from 43% share in 2012 to 28% in 2013 and to 21% in 2016 (incl. Kindle Fire). The remainder of this market is made up of devices from Microsoft (1% share in 2012, 12% share in 2013 and 23% share in 2016) among others. See Exhibit 29.

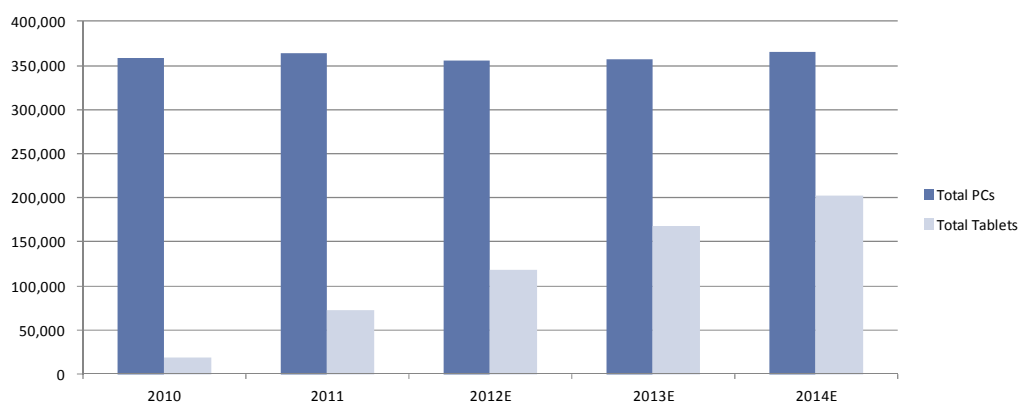
Exhibit 29: Market share by device

	2005	2006	2007	2008	2009	2010	2011	2012E	2013E	2014E	2015E	2016E
Consumer Compute Market Share by Device												
Consumer PC												
Windows	94%	94%	93%	93%	93%	93%	91%	91%	90%	89%	89%	89%
Mac OS	6%	6%	7%	7%	7%	7%	9%	9%	10%	11%	11%	11%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tablet												
iOS Tablet Share	0%	0%	0%	0%	0%	77%	56%	56%	60%	61%	58%	56%
Android Tablet Share	0%	0%	0%	0%	0%	22%	43%	43%	28%	23%	22%	21%
Kindle Fire Share	0%	0%	0%	0%	0%	0%	7%	10%	6%	5%	5%	5%
Android ex-Fire	0%	0%	0%	0%	0%	22%	36%	33%	21%	18%	17%	16%
Windows Tablet Share	0%	0%	0%	0%	0%	1%	1%	1%	12%	16%	20%	23%
Total	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%
Smartphone												
iOS Smartphone Share	0%	0%	3%	10%	15%	16%	20%	20%	18%	20%	24%	27%
Android Smartphone Share	0%	0%	0%	1%	5%	23%	47%	55%	53%	51%	50%	48%
Windows Smartphone Share	6%	9%	11%	13%	11%	4%	2%	3%	7%	11%	13%	18%
Others Smartphone Share	94%	91%	86%	77%	70%	58%	31%	22%	22%	18%	13%	7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
eReaders												
B&N eReader Share	0%	0%	0%	0%	0%	14%	13%	11%	11%	11%	11%	11%
Kindle eReader Share	0%	0%	0%	0%	0%	55%	62%	33%	25%	20%	20%	20%
Others eReader Share	0%	0%	0%	0%	0%	31%	25%	56%	64%	68%	69%	69%
Total	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%
Total Consumer Compute Market Share by Vendor												
Apple	21%	22%	21%	23%	22%	21%	23%	24%	23%	25%	27%	29%
Google	0%	0%	0%	1%	3%	14%	33%	42%	41%	41%	40%	39%
Microsoft	49%	46%	43%	46%	46%	35%	25%	20%	20%	22%	23%	26%
Other	29%	32%	35%	31%	30%	29%	18%	14%	15%	13%	9%	5%
Total	79%	78%	79%	77%	75%	65%	44%	34%	35%	35%	32%	31%

Note: Total consumer compute market share by vendor includes gaming consoles and streaming music players, which are visible in Exhibit 24.

Source: IDC, Goldman Sachs Research estimates.

In terms of the breakout between consumer and commercial tablet adoption, IDC estimates that around 94% of tablets shipped in 2011 were for consumer use while only 6% were for commercial use. By 2016, consumers are expected to adopt around 83% of total units shipped, while the remaining 17% of units will be for commercial use. As the tablet market is broadly being propelled by consumer purchases, we think that it is reasonable to assume that consumer preferences regarding vendor/ device have a meaningful influence on commercial purchasing decisions now and in the future, especially in a world moving increasingly toward BYOD. That being said, total tablet shipments are expected to rival consumer PC shipments in 2013 (168mn tablets vs. 193mn PCs) and surpass consumer PC shipments in 2014 (203mn tablets vs. 199mn PCs), based on Goldman Sachs forecasts. In fact, in our view, the lines are blurring between consumer PCs and tablets, and as such these device categories will likely converge as OEMs become more adept at creating form factors that can cross both categories in more convenient ways. See Exhibit 30.

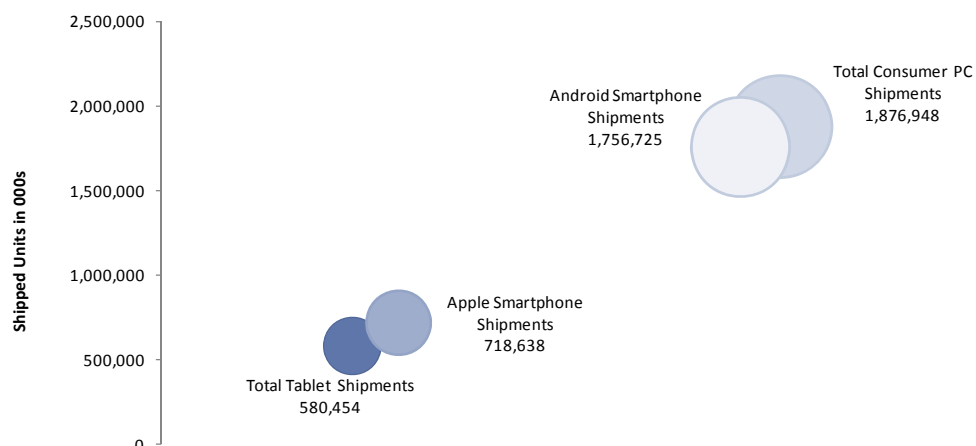
Exhibit 30: Consumer PC shipments versus total tablet shipments (000s)

Source: IDC, Goldman Sachs Research estimates.

More important than the release of the physical smartphone or the tablet has been the emergence of broad application ecosystems surrounding each platform. We think that the cross-device capabilities (or lack thereof) offered by each ecosystem increase switching costs for users as they leverage the massive application catalog that exists for each.

There are more than 750K iPhone and iPad apps, which have been downloaded 35bn times, and there are more than 700K Google Play Apps, which have been downloaded 20bn times (for comparison, we note that Microsoft's application store, which just started, has around 20K Windows 8 applications and is growing quickly). Importantly, Apple's application ecosystem is tied directly to its own operating system, which is limited to its own devices, while many Android applications are capable of running across Android devices (Kindle Fire devices are a notable exceptions as they only run applications from the Amazon.com Appstore, which has only a fraction of the total applications that are available for Android, for example from Google Play). Furthermore, as the Apple and Android platforms have emerged as the front-runners in today's platform wars, developers have been cognizant about developing applications for both platforms or are relying on browser-based applications that are OS/ device-agnostic. Given the low costs associated with porting applications from one platform to another, we would expect the market to support three broad ecosystems.

That said, we believe it is still relatively early days for the platform revolution as a majority of the global population has yet to adopt a smartphone (as noted above, smartphones are expected to be only around 39% of the total mobile phone market in 2012; 70% of handset shipments in developed markets vs. 29% in emerging markets) and even fewer have adopted tablets (see Exhibit 31). Accordingly, we believe there is a large revenue opportunity still to come for the key platform providers. Along these lines, our survey work suggests that content/ application spend increases when an individual owns a smartphone and a tablet that share a common platform; to date, this trend has favored Apple and we would expect it to do so going forward as well.

Exhibit 31: Total devices shipped between 2000-2014E

Source: IDC, Goldman Sachs Research estimates.

As shown by our mobile user survey, consumers indicated that (1) familiarity with a platform and (2) the ability to continue to use previously purchased applications are critical factors when deciding on new device purchases. Accordingly, it is clear that having a first-mover advantage is important, though we note that the new device itself must be a compelling standalone offering, otherwise the user may not be willing to stay with a given ecosystem. Accordingly, considering only these two criteria in the context of Apple, Android and Microsoft, we note that Apple's integrated system strategy enjoys the following advantages:

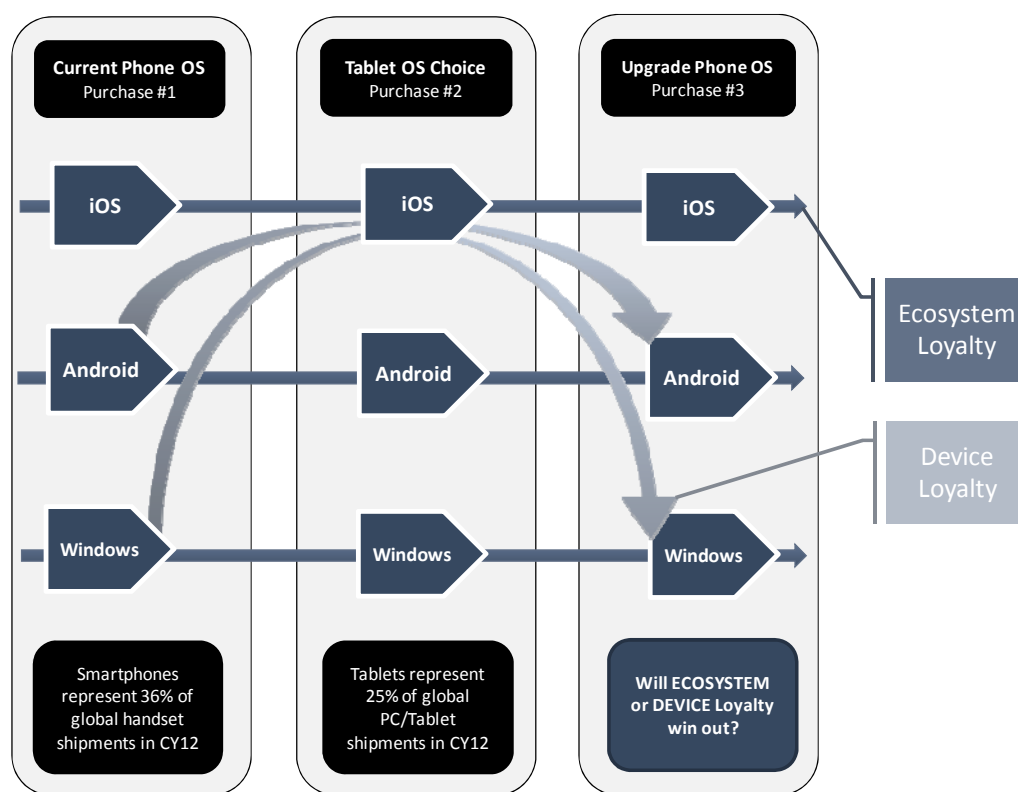
- Fragmentation of the Android-based device ecosystem, while favorable in the context of market penetration, also presents a significant hurdle around establishing a consistent "Android" user experience. We note, however, that of the 367mn Android smartphone shipments expected in 2012, roughly 56% of these are estimated to be driven by Samsung.
- Android device proliferation creates challenges around transferring content between Android devices. As an example, even Android smartphone leader Samsung does not offer an easy process to transfer content; Samsung describes four different methods to transfer music, photos, videos, each of which can involve a complicated set of processes depending on the device or content type. We see the emergence of cross-platform third party storage solutions such as Dropbox, Box, and Google Drive alleviating some of this burden.
- As we have stated, we think it is still early days for Microsoft in both the tablet and smartphone markets relative to Apple and Android. That being said, we think the release of Windows 8 and Windows Phone 8 will help the company achieve a more meaningful presence within both markets as the company drives adoption within its installed user base, especially among Office loyalists.

Our conclusion: although some might say the battle looks won at this point, we think the compute revolution is actually in its infancy with the competitive battle just getting started. Our long-term view is that there will ultimately be a closed loop between smartphone, tablets and other devices, such as TVs, that will keep users tied to an ecosystem (more on this topic on page 42 of this report).

The user path to standardizing on a platform

While it can be debated whether the smartphone or the tablet is the “anchor” device that binds a user to a particular platform, in our view the path to standardization is not fixed and the so-called “anchor” device can be different at different points in time. As outlined in Exhibit 32, we believe users will choose between device loyalty and ecosystem loyalty, and we see three distinct and likely paths for users as they standardize on one platform which we outline thereafter. In our view, we are still in the early stages of smartphone adoption. Goldman Sachs analyst Simona Jankowski estimates that smartphones will be 39% of total handsets in 2012, which compares with 27% in 2011 and 19% in 2010. Furthermore, in developing markets, only 29% of total mobile phone shipments are estimated to be smartphones in 2012. That being said, the base of smartphone users is much larger than the base of tablet users; we estimate that between 2007 and 2012 around 1.1bn Apple, Android and Windows smartphones shipped vs. 210mn total tablet shipments. Between 2007 and 2014, we think 2.9bn Apple, Android and Windows smartphones will have shipped versus 580mn tablets worldwide.

Exhibit 32: User will choose between ecosystem loyalty and device loyalty



Source: Goldman Sachs Research.

As mentioned earlier, we believe in the current landscape there are three different paths to ecosystem loyalty for consumers which we outline below.

Path 1: In this scenario, the user owns an iPhone but not a tablet. In our view, given the importance of familiarity (cited by 86% of smartphone owners in our survey) and of using apps across devices (cited by 40% of non-tablet owners), the user is most likely to purchase an iPad. Our view is supported by our survey results in which the iPad enjoyed 67% tablet

share among iPhone owners. At this point, with the ability to sync media and apps across both devices the user has effectively standardized on Apple's platform.

Path 2: The user owns a smartphone other than the iPhone and does not own a tablet. In this scenario, we believe the importance of familiarity diminishes as compelling alternatives to the iPad have only trickled onto the market thus far. Our view on fragmentation is supported by the fact that the iPad enjoyed 32% tablet share among non-iPhone owners, compared to the Kindle Fire at 40% and Android tablets at 25%. At this point, we view this user as roughly just as likely to purchase an iPad as any other tablet. That said, if the user does purchase an iPad, we believe the ability to sync media and apps will result in this users next phone purchase likely being an iPhone.

Path 3: As in path 2, the user owns a non-iPhone smartphone but not a tablet. However, in this scenario we assume there is a compelling alternative to the iPad, whether it is the Kindle Fire, Google Nexus 7, Microsoft Surface or some new device. If one of these new or relatively new entrants is on the same platform as the user's smartphone, in our view, the user is likely to purchase that tablet given the appeal of familiarity and the desire to cross-sync apps and media.

Vendor implications

Amazon: by leveraging its large customer base, the company has made significant inroads with its Kindle Fire tablet offering, which is expected to have garnered 10% of the global tablet market as of 2012 (this is notable as it was released only in September 2011). Further, through its Kindle and CloudPlayer apps, which are available for both iOS and Android devices, and its Instant video for iPad app, Amazon has effectively made its offerings a platform-within-a-platform and enabled distribution across the majority of computing devices. That said, as with any non-Apple music app, using Cloud Player on iOS is not entirely frictionless. For example, songs purchased from iTunes prior to Apple dropping digital rights management restrictions cannot be imported in to Cloud Player without some form of work-around, such as burning them to a CD and then re-importing from the CD. In a world in which HTML5 is perhaps 3-5 years away from becoming a true platform of its own, if at all, we would not be surprised to see Amazon.com at some point launch a smartphone to bolster its presence in the mobile ecosystem space. This is especially the case given the shift of physical media to digital.

Apple: Given the current industry dynamic in the mobile ecosystem space, in our view Apple can maintain its lead through continuing innovations and platform adoption. As detailed in our report, *Apple Inc. (AAPL): How resilient is the platform and what are the real risks?*, June 29, 2012, Apple enjoys a high degree of platform loyalty, which becomes even more pronounced with users who own more than one device. Not only does this dynamic result in few defections from the platform, but it also lays the foundation for a powerful number of upgrades in the future. By our estimate, only 69 million iOS devices shipped in FY2012 were upgrades, but this number can surpass 195 million in FY2014. In addition, we believe that Apple has plenty of room to attract new users. Most notably, we believe the company can sharply increase its share in emerging regions, as its platform takes hold and new devices such as the iPad mini and lower priced iPhones make entry more affordable. If we are taking the Windows smartphone number down, we can boost the iPhone share in the units beyond our published forecast horizon. As outlined in greater detail in the *Compute evolution* section on page 20, over time we would expect overall smartphone and tablet share to converge given the power of familiarity with the operating system and ability to sync media and apps across devices.

Google: While Google has garnered significant share of the smartphone market with its Android operating system, we continue to view a breakout tablet offering as critical to protecting its high market share. As we have said, given the pull of familiarity and synced

app use, we believe smartphone and tablet share are likely to converge over time. As such, in a world where Google does not have a compelling tablet offering, not only is the company's ability to play in the mobile media and device space limited, but mobile search margins will be negatively impacted due to high TAC rates. Without a successful tablet offering, in our view, Google, which has long dominated desktop search without having to pay materially for distribution, will face a mobile world not just where CPCs (cost per click) are lower, but where they have to rely on others platforms for distribution. For example, one item to watch, in our view, is if Samsung, given it is the workhorse of Android, will be able to extract TAC payments from Google in the future or some sort of tax for making Android a brand name.

Samsung Electronics: We estimate that Samsung Electronics' global smartphone market share may reach 33% in 2012, making the company the largest smartphone vendor. Although over 95% of these devices may be on the Android platform, Samsung Electronics maintains a multi-operating system policy. In other words, the company is operating system agnostic – Samsung Electronics will provide products in line with consumers' demands focusing on hardware differentiation (AM OLED panel, larger screen, better application processor, etc). With the largest reach, fast design times, and differentiated designs, we believe that platform providers such as Google and Microsoft may continue to rely on Samsung Electronics disproportionately compared to other OEM makers, a virtuous cycle for Samsung Electronics. Meanwhile, Samsung Electronics' success in the tablet market has been mixed compared to the company's smartphone success. For example, we estimate that Samsung Electronics' tablet market share may only reach 12% (albeit better than single digit in 1H12) in 2012 compared to 33% for smartphones. We attribute the difference to Samsung Electronics not being able to offer a compelling device at a differentiated price from market incumbents. However, with hardware (S-Pen; the stylus) differentiation and more realistic pricing for less differentiated products it appears that Samsung Electronics' tablet momentum is gaining momentum. We believe that Samsung Electronics plans to leverage its semiconductor/hardware differentiation, relationship with platform providers, and scale to become a more aggressive tablet provider over the mid-term. For now we expect that Samsung Electronics will continue to focus on providing hardware and that even over the mid-term the company is unlikely to focus on an internally developed operating system.

Microsoft: We view the success of Microsoft's Surface tablet as critical to its ability to compete in this new compute paradigm. In our view Microsoft's tablet offerings will likely be the key anchor in determining pull through of Windows-based smartphones. Further, we would not be surprised to see the company release a Microsoft branded smartphone at some point, following in its lead of developing its own tablet offering, Surface. As such, we would expect Microsoft to increase its share in both the tablet and smartphone markets, but at what level remains to be seen.

Should I stay or should I go? How users choose a platform

Given the importance of attracting and retaining users, we looked at three different user segments and their preferences on the path to standardizing on a platform:

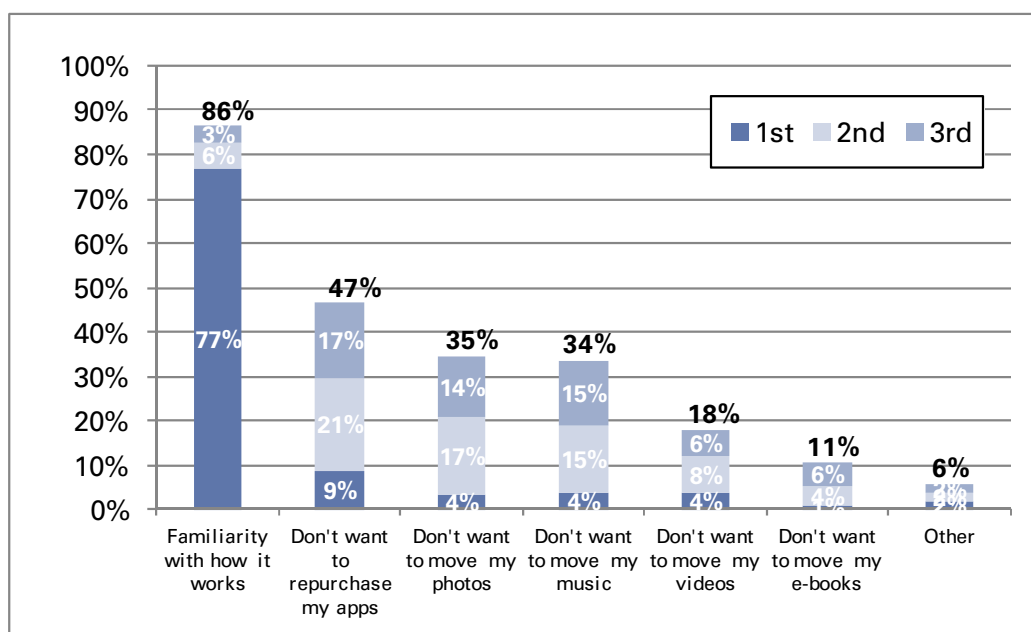
1. Loyal users who remain with the platform they are already on.
2. Defectors, who leave one ecosystem to become new users of another.
3. Brand-new users who have yet to purchase a smartphone or tablet.

Loyalists: Familiarity and app purchases likely limit churn

We define this group as those who are likely to stay because of familiarity with the user interface (UI) and convenience with content/apps (e.g., don't have to repurchase again). In our proprietary survey of over 1,000 smartphone owners (see Exhibits 33-34):

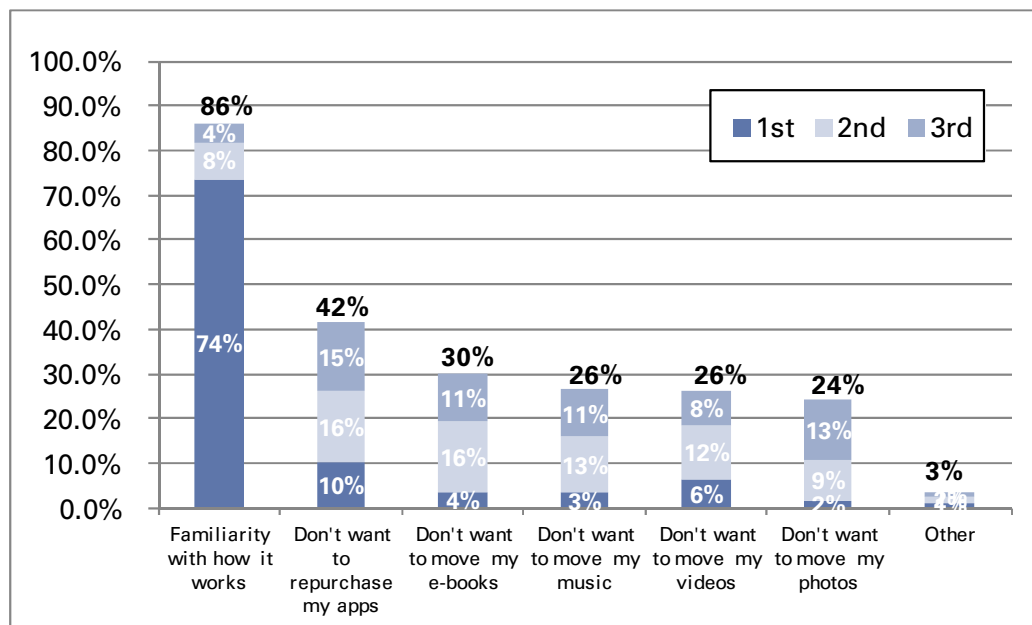
- 86% reported that **familiarity with their current device** would be a top-three consideration in their next devices purchase.
- Among the tablet owner sub-group, 86% also reported that **familiarity** was a top-three criterion.
- 47% of smartphone owners and 42% of tablet owners stated their **purchased apps** would be a top-three factor in remaining on the same platform.
- Among respondents who do not own a tablet, 40% indicated apps purchased on their smartphone would be a primary driver in a tablet purchase decision.

Exhibit 33: For your next smartphone purchase, what would make you buy the same device again? Please rank the three most important features or select all. (n=977)



Source: Goldman Sachs Research.

Exhibit 34: For your next tablet purchase, what would make you buy the same device you have now again? Please rank the three most important features. (n=582)



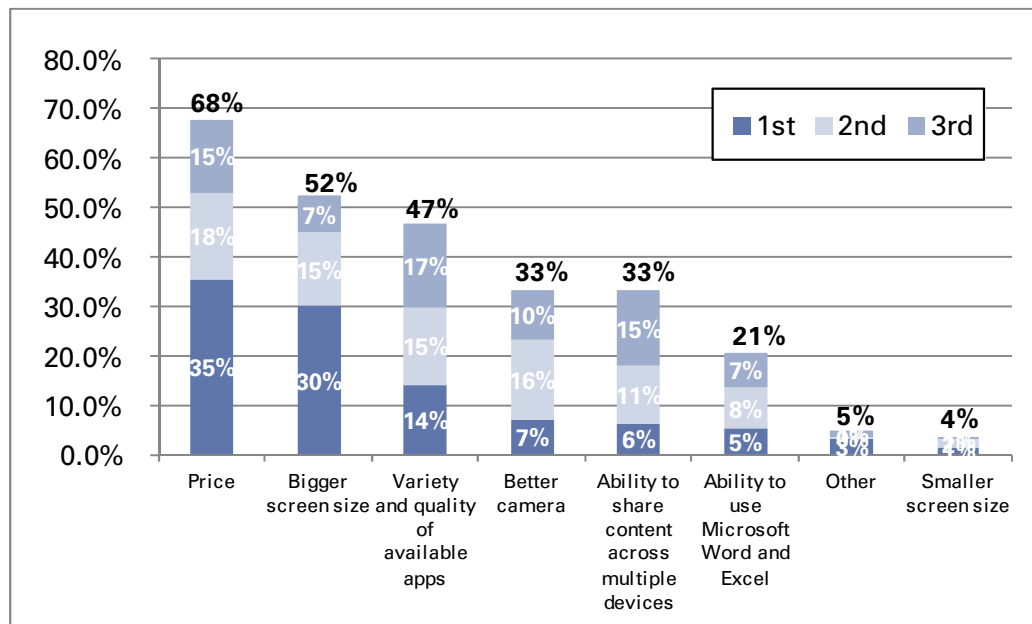
Source: Goldman Sachs Research.

Defectors: Pricing is key, but app ecosystem also important

We highlight a few points from our survey that lead us to conclude that pricing and the application ecosystem are key factors in driving user defection (see Exhibits 35-36):

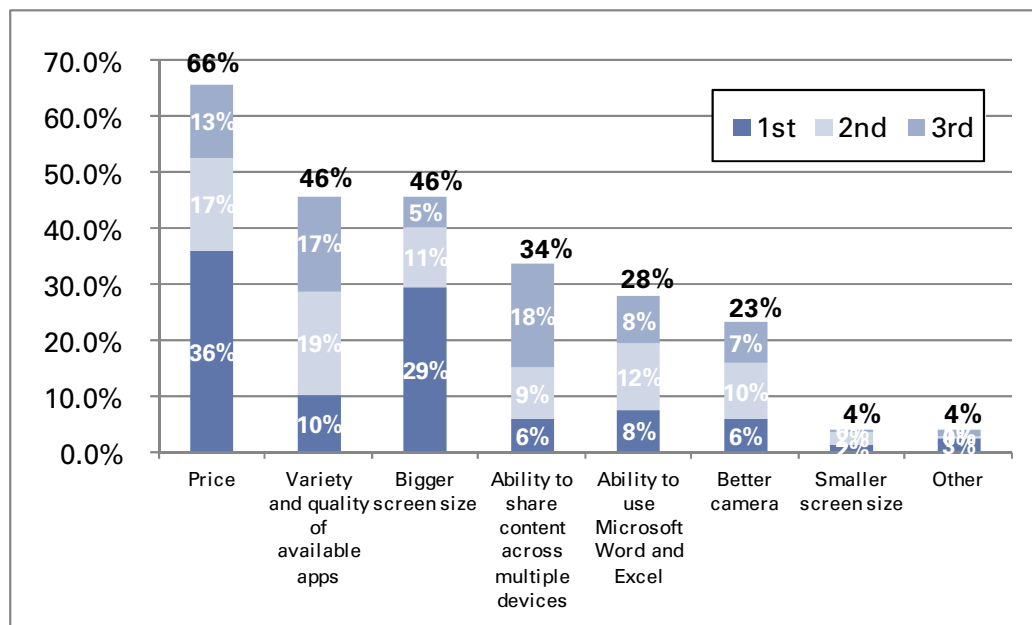
- 68% of smartphone owners reported that **price** would be a top-three factor in switching ecosystems for their next device purchase. That said, in a June 29 report on Apple, *How resilient is the platform and what are the real risks?* Goldman Sachs hardware analyst Bill Shope highlighted results from a survey of iPhone users in which the weighted average discount needed to get them to consider switching platforms was approximately 50%, or a discount range of about \$200-\$400 across the iPad product family and roughly \$50-\$200 for the iPhone.
 - 68% of both Android phone users and Windows phone users named price as a top factor, whereas 63% and 61% of iPhone and Blackberry users, respectively, listed price as a top consideration.
- Among the tablet owner sub-group (respondents who own both a smartphone and a tablet) 66% of respondents reported that **price** was a top-three consideration.
 - 67% Android tablet and 69% of Kindle Fire owners ranking it in their top three versus 63% of iPad owners.
- That being said, 47% of smartphone owners and 46% of tablet owners cited the **quality and variety apps** available as a top three factor in switching platforms.

Exhibit 35: What would make you switch smartphone device ecosystems? Please rank the three most important features or select if you don't care because you don't use the phone's ecosystem. (n=908)



Source: Goldman Sachs Research.

Exhibit 36: What would make you switch tablet device ecosystems (i.e., Google Android to Apple iOS or vice versa)? Please rank the three most important features. (n=553)



Source: Goldman Sachs Research.

Looking at other potential feeder devices

While smartphone penetration has risen dramatically over the past years, in 2012 only 39% of global handset shipments are expected to fall into this category, with penetration higher within developed markets versus emerging markets.

- In 2012, 70% of handsets shipped in developed markets would be smartphones vs. 29% in emerging markets.
- In 2013, 81% of handsets shipped in developed markets would be smartphones vs. 39% in emerging markets.

With tablet penetration even lower, at 25% of combined total PC and tablet unit shipments in 2012 (32% in 2013), it is clear that the battle for market share in these categories will continue unabated. In our view, users new to an ecosystem, who have never owned a smartphone or tablet, will likely transition over from a potential feeder device.

We see three types of devices that could serve as a seeding ground for brand new users: digital music players, gaming consoles, and eReaders.

In our view, the teenage demographic could be the key battleground as these users are likely to represent the greatest opportunity to grow an installed base. Users are exposed to a platform at an early age and, as a result, not only become familiar with the user interface but also begin to build a library of content, effectively creating lock-in. These users would represent the highest lifetime value of a customer if they can be retained. While those older than 45 may not be as financially attractive as teenagers, they have readily disposable income.

Digital music players: In our view, digital music players will continue to serve as potential feeder devices, particularly for the attractive teenage demographic. The iPod was the earliest beneficiary of Apple's platform model, so in contrast to the other platform spokes, the iPod has already dominated its core market opportunity (with over 70% of the US market for MP3 players in the September quarter). While the iPod receives little investor attention any more, we believe it continues to serve a critical role in onboarding users to the iOS platform. We continue to see the iPod touch as capturing the incremental opportunity for users that want a handheld computing device without voice functionality. This has been particularly attractive to younger consumers as well as handheld gaming enthusiasts. We note a June 2012 survey by comScore and AdMob indicated 69% of iPod touch users were 13-24 years old, versus only 25% for the iPhone. Importantly, the iPod touch user interface and functionality essentially mirror that of the iPhone and iPad, which paves the way for an easy transition to either device and presents an opportunity for Apple to grow younger users into its iPhone and iPad ecosystem.

Gaming consoles: Microsoft is the clear leader in this category among the major platform providers, and one could argue the Xbox 360 gaming console could represent a meaningful seeding ground for Windows. With 70mn units shipped life to date (or assuming an installed base of 36mn units based on shipments from FY11 to FY13), the Xbox 360 has attracted both traditional gamers as well as casual users (via Kinect). Moreover, the console offers the ability to access music content and videos / TV programming. With that said, the success in migrating these users to a Windows smartphone (Xbox Live is integrated in Windows Phone) or tablet has yet to be determined. In our view the use case for the Xbox 360 is centered on what it does extremely well: provide an engaging traditional gaming experience. In contrast, smartphones and tablets provide a more casual gaming experience where the use case may not necessarily need to be tied to the Xbox. For example, games customized for the smartphone or tablet accessed through applications could suffice.

eReaders: Although the eReader category has likely served as a feeder device for Amazon (Kindle to have 33% market share in 2012) and could potentially serve as a feeder device for Microsoft (Nook to have 11% market share in 2012), we see the eReader market being

subsumed by the broader tablet market over time. For AMZN in particular, we think the company's eReader presence declines as customers opt to purchase Kindle Fire tablets (launched in September 2011), which have broader functionality versus the standalone Kindle eReader at a comparable price point (an 8GB Kindle Fire starts at \$159 vs. the most basic Kindle at \$69 or the Kindle Paperwhite at \$119). Other tablets in the sub-10 inch category, which is similar to the eReader form factor, include the Samsung Galaxy Tab (launched September 2010), the Google Nexus 7 (launched June 2012) and the iPad mini (launched October 2012).

HTML5 could change everything

Turning to longer-term market analysis, we now look at potential changes that could disrupt the competitive dynamic we have outlined for the near and medium term. The promise of HTML5 is that it can liberate the services and media that users consume from any specific device. As an example, instead of utilizing a natively developed iOS application that is confined to Apple's device ecosystem, a user can access browser-based HTML5 content from any internet-connected device. Indeed, abstraction is the way of technology, just as virtualization decoupled the operating system from the underlying hardware and Software-as-a-Service freed enterprise applications from the corporate data center.

Sweeping technology transitions take time. Salesforce.com, the premier SaaS CRM vendor, was founded in 1999, yet the SaaS CRM market accounted for just 24% of the total CRM market in 2011, according to IDC. Similarly, the dominant virtualization vendor, VMW was founded a year earlier in 1998, but our field work indicates almost 55-60% workload penetration at the end of 2012. In our view, HTML5 is just as potentially disruptive as SaaS and virtualization, and we would expect the journey will be similarly as long.

What is HTML5?

HTML5, which stands for hypertext mark-up language 5, is the forthcoming version of the standard programming language for building websites. In the form that many now expect, HTML5 would add significant functional capabilities to current web code. These include push notifications, off-line storage, 2D graphics, improved audio and video streaming, along with access to a device's camera and other sensors. These capabilities would allow developers to create web-based apps for any mobile device in a true write-once-run-anywhere fashion by eliminating the need to rely on native code resident on a device or third-party software known as plug-ins to deliver these functionalities. In this way, HTML5 would allow consumers to select services and devices independently of each other. Also, HTML5 is attractive to developers as it has the potential to eliminate or reduce the distribution fee they pay to app stores.

As a definitional note, in common usage HTML5 has become synonymous with the "future of the internet". In practice, this concept encompasses more than just HTML5 and includes updates to the cascading style sheets 3 (CSS3) language which governs the look and feel of webpages as well the hypertext transfer protocol (HTTP) for creating links between webpages.

HTML5 standard likely won't be complete until 2014

The standardization process for HTML5, which began in 2004, is controlled by the World Wide Web Consortium (W3C), which has set a date of 2014 for issuing a ratified standard. As a result, the research firm Gartner does not see mainstream adoption of the full HTML5 standard until year-end 2014.

Because of the protracted ratification process, the Webkit project, led by Apple and Google, was formed in 2001. The Webkit browser engine incorporates production ready pieces of the HTML5 specification, such as embedded video for native rendering, and forms the basis for the mobile and desktop versions of Apple's Safari browser and Google's Chrome browser. However, Microsoft's Internet Explorer and Mozilla's Firefox browsers are not based on Webkit. This split presents developers with the danger of needing to develop multiple versions of their websites.

Mobile browsers lag support in giving access to device features

The dominant mobile browsers, Apple's Safari and Google's Android browsers, do not provide the functionality necessary to transform native mobile apps to web-based apps.

In February, Facebook launched its mobile website testing suite called Ringmark to allow mobile developers to test which browsers support HTML5 and other functionality their web-based mobile app would need. The suite groups specific tests into groups, or “rings”, of features of similar complexity. The following is a post from Facebook’s developer page:

You can think of the rings as straightforward software versioning. Ring 0 represents the base functionality that most mobile phones have today. Ring 1 represents what functionality is needed to unlock the most common apps that developers want to build; specifically, 2D games, music and video apps, and camera apps.

From there on, each subsequent ring represents a slice of features that will unlock the next generation of mobile web apps, based on developer necessity. For example, we expect Ring 2 to include upcoming technology like WebRTC and WebGL.

Examples of the types of apps in Ring 0, which could now be made into web apps based on browser functionality, would be Words With Friends, YouTube, Facebook and Twitter, to name a few. Apps that would need Ring 1 capabilities to become web apps would be Angry Birds, Cut the Rope, Spotify, Vimeo, and Instagram among others.

WebRTC in the text above refers to an HTML5 API (application programming interface) designed to enable voice calling, video chat, and file sharing without plug-ins. WebGL is an API for 3D graphics rendering.

As shown in Exhibit 37, the most used mobile browsers, Safari and the Android browser, fail nearly a third of the tests in the Ring 1 battery, implying the migration of native smart phone apps to the web depends on continued development by mobile browser makers. Even Chrome for Android, the newest mobile browser introduced by Google at the beginning of the year, failed a tenth of the tests in Ring 1. Looked at differently, Ringmark and IDC estimate that roughly 90-95% of native mobile apps in the entertainment, gaming, and reference categories could become web-based apps if mobile browsers were Ring 1-compliant.

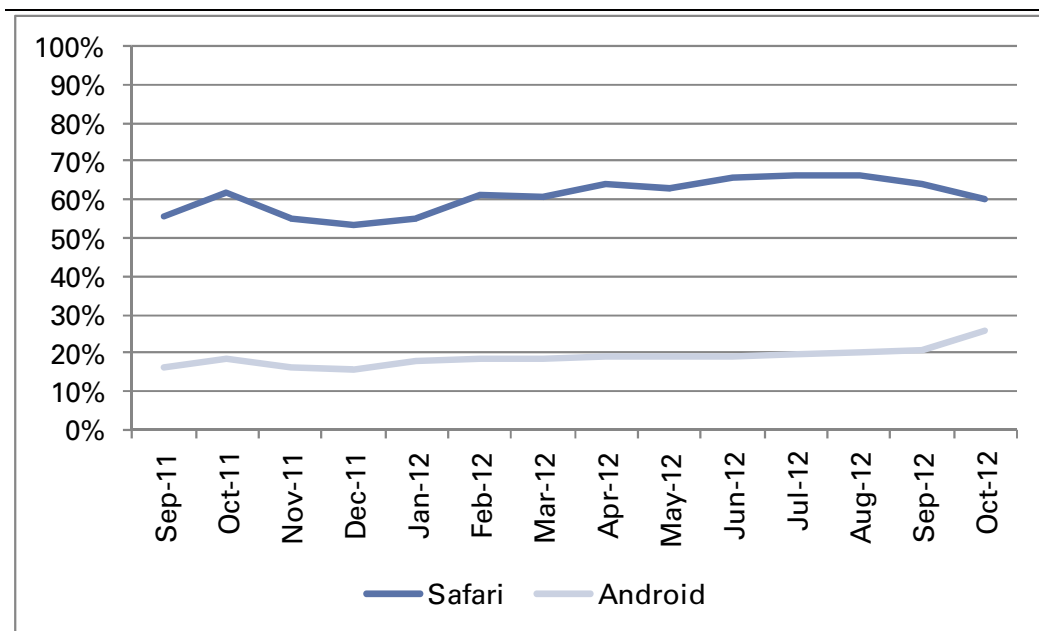
Exhibit 37: Mobile browsers failing to support web-based apps

Results from Ringmark tests to determine if browsers have the capability to support web apps.

	Ring 0		Ring 1	
	Passed	Failed	Passed	Failed
iOS Safari	97	0	106	34
Stock Android browser	97	0	93	44
Android Chrome	97	0	143	17

Source: www.readwriteweb.com

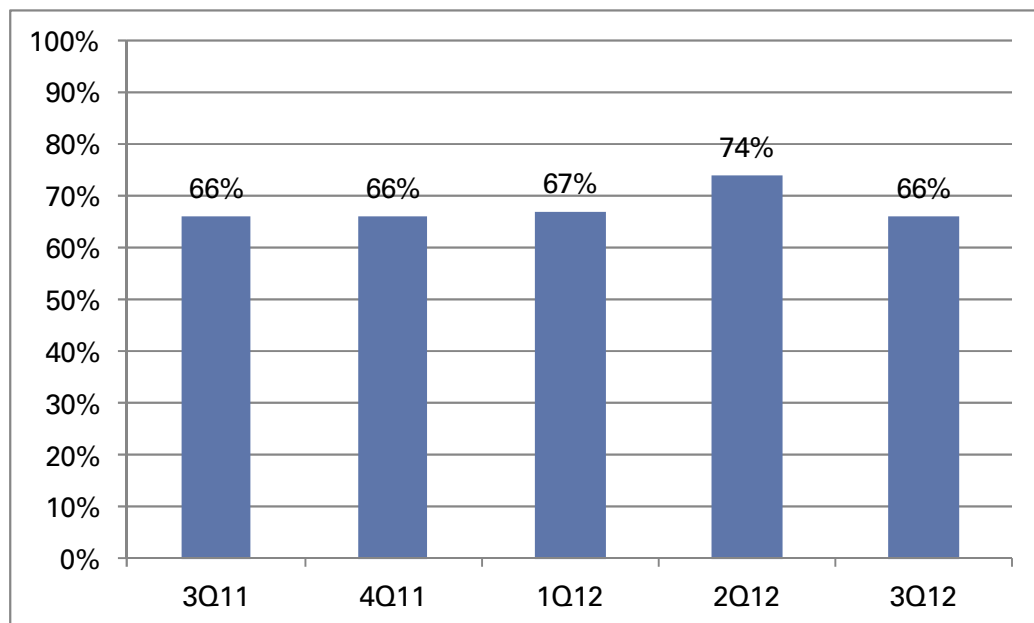
Exhibit 38 shows Safari and the stock Android browser’s share of mobile web traffic by unique user, which account for a combined 85% of mobile web traffic.

Exhibit 38: Mobile browser share by unique users

Source: NetMarketShare.

Developer interest in HTML5 is high, but skews toward hybrid apps

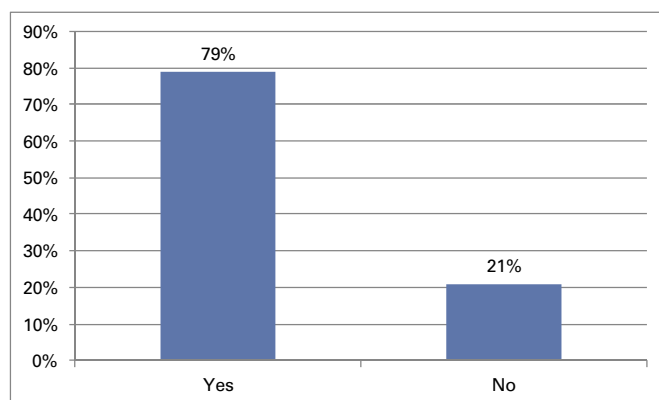
According to Appcelerator and IDC's quarterly survey of mobile developers, interest in the HTML5 platform continues to be high. While down from 74% in the 2Q12 survey, 66% of respondents indicated they were "very interested" in developing for the mobile web in HTML5. See Exhibit 39.

Exhibit 39: Mobile app developers "Very Interested" in developing for HTML5

Source: IDC/Appcelerator.

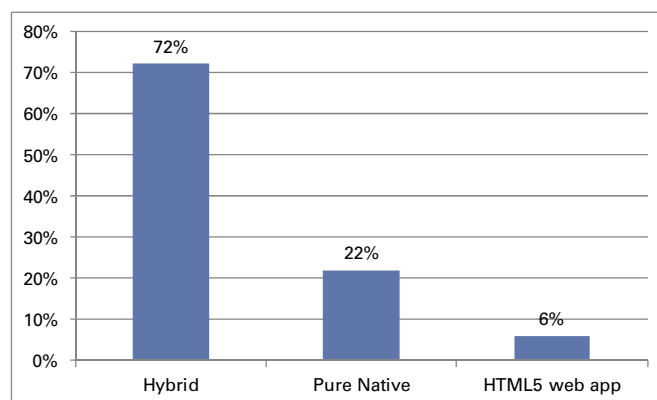
Further, in the 1Q12 Appcelerator survey, 79% of respondents indicated that they plan to use elements of HTML5 in their 2012 initiatives. However, of those planning to use HTML5 only 6% reported planning to build HTML5 apps for the mobile web only, while 72% indicated they would pursue a hybrid strategy which incorporates both native device code and HTML5 programming. In our view, this indicates that most developers see device-agnostic HTML5 apps as a ways off. In fact, Facebook has spoken recently about its view that HTML5 is several years out and as a result over the past 12 months re-focused its engineering efforts back towards iOS and Android apps. Facebook released its latest iOS app in August, while its updated Android app is currently undergoing internal testing. See Exhibits 40-41.

Exhibit 40: Do you plan to use HTML5 in 2012?



Source: IDC/Appcelerator.

Exhibit 41: Only 6% plan to build HTML5 mobile web apps



Source: IDC/Appcelerator.

What does the near future look like? A lot like today.

With mainstream HTML5 adoption likely a few years away, we see little else that could disrupt the current app-centric, device-specific mobile environment for some time. Indeed, even when HTML5 adoption reaches critical mass, there will still be a significant number of legacy apps in the installed base that would make legacy platforms sticky. In this respect, the time it takes for HTML5 to be viable becomes increasingly important over time. Thus, we would expect the current competitive landscape to remain relatively unchanged in the medium term.

Are televisions the next wave of disruption?

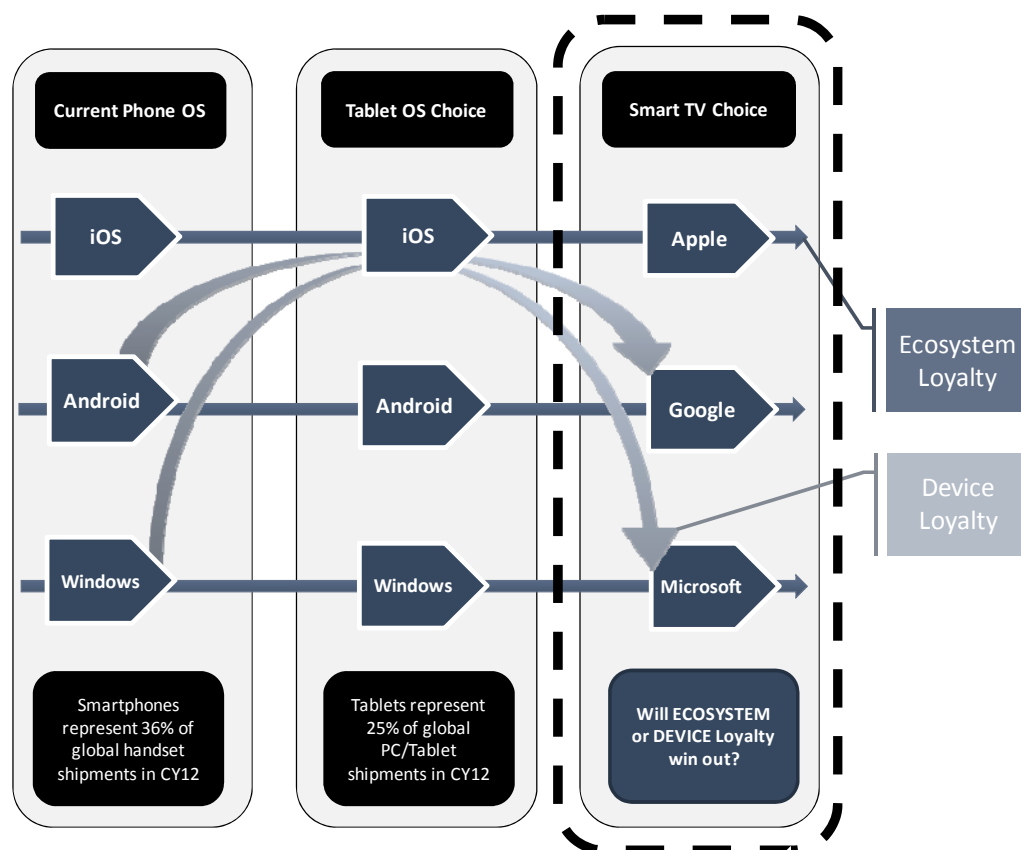
The debate around whether the television will serve as the next playing field in the compute revolution is driven by two factors:

- 1) Speculation around the potential for television innovation from non-traditional vendors, i.e., Apple.
- 2) An ongoing discussion around cord cutting and an interest in disassembling the cable content bundle.

As it pertains to today's consumer cloud platforms, we see the television as a natural extension of the computing landscape. In terms of platforms and two-sided markets, this can be thought of as providing an additional device on which complements can deliver services to end users. However, as we see innovation within the television landscape from Apple, Google, Microsoft and others, we would not be surprised to see television enable another industry shake-up, just as client-server ushered in the Microsoft era or smartphones and tablets brought Apple to prominence. For example, it is easy to imagine a connected television being a household's hub for video chat in addition to delivering streaming entertainment and online gaming. Other key mobile compute platform attributes we see integrating well with televisions are content distribution through the cloud, viewing owned content, and the more intuitive and user friendly interface. That said, we believe this piece of the compute revolution is still in the earliest of days.

TV's could create the highest user switching costs

As a part of the consumer cloud ecosystem, we see the television as having the potential to be a powerful anchor device for platforms due to its higher purchase price, longer replacement cycle and prominent place in the living room. On purchase price, the average selling price of an LCD television globally is roughly \$480, according to DisplaySearch. However, the average price of a 46 inch LCD television, the typical size we view as necessary to be the center of family viewing, is more than \$950. This is significantly higher than the ASP for a smartphone (\$309 unsubsidized in 2012 per Goldman Sachs analyst Simona Jankowski) and more than even the most expensive tablets (64GB iPad with retina display has a list price of \$699). As such, once a consumer adds a television to their crop of cloud ecosystem devices, in our view the user is then more likely to shift their less-expensive tablet and phone devices to the same ecosystem as their television, if they differ. If a user purchases a television on the same platform as his or her other devices, we believe this further entrenches the user in that ecosystem. See Exhibit 42.

Exhibit 42: Will Smart TVs be the next battle ground in compute?

Source: Goldman Sachs Research.

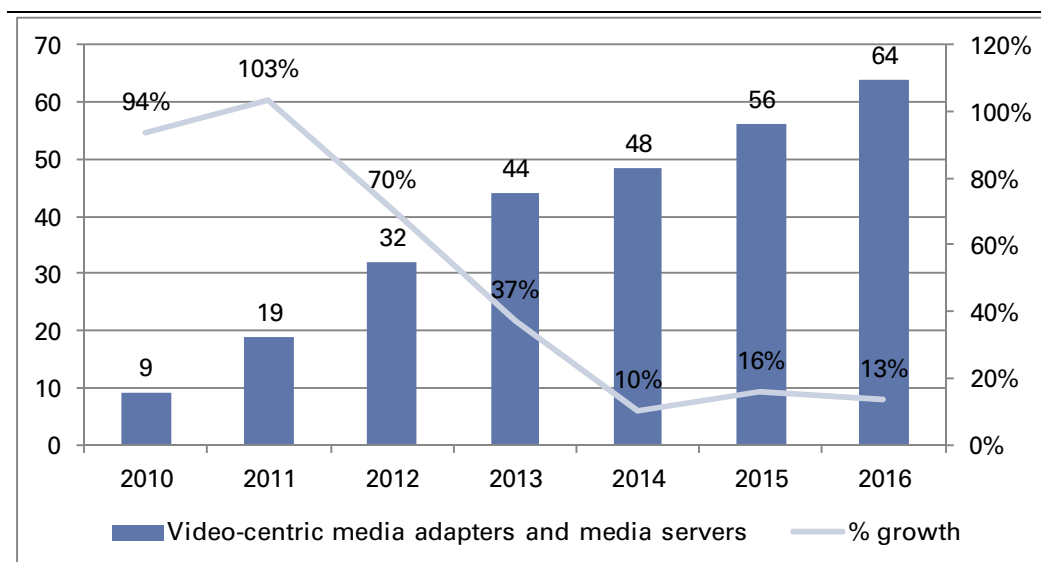
Further, the replacement cycle for televisions is significantly longer than for tablets and smartphones. Based on IDC's estimates for annual shipments and the installed base of network-enabled, televisions we estimate the useful life of these devices to be four years, while historically the LCD television replacement cycle has been roughly 8 years, which compares to roughly two years for tablets and phones. As such, we would expect consumers to align their devices to their televisions, which they replace relatively less often. That said, we also view the television as creating the potential for ecosystem disruption should one of the players create an offering compelling enough to lure users away from the ecosystem of their tablets or phones. Ultimately, we view the addition of a television to a user's set of ecosystem devices as dramatically increasing the switching cost of leaving a given platform. Finally, because the television is more a household device than an individual device, we would note that the television has the potential to affect platform decisions for multiple people rather than for just a single individual.

Early disruption starting with TV attachments

Many players have moved into the television market with attachments for the television, or what IDC calls "video-centric media adapters," which offer first and third party video streaming. These vendors include Apple with the Apple TV, Google with Google TV and Roku with its small set-top boxes. Additionally, Microsoft has entered the video streaming space with its Xbox gaming console. All of these devices offer an integrated Netflix service for subscribers, and, with the exception of the Apple TV, all integrate an Amazon Instant Video service (although Instant Video can be accessed through screen mirroring with

Airplay), which is available for free to Amazon's Prime members. That said, the Apple TV, Roku boxes and Xbox integrate with the Hulu Plus video service. Further, all these devices provide music sources or services: (1) the Apple TV does so through iTunes Match, its streaming service, or by linking to an iTunes library on another device or by screen mirroring a device running another content source such as Pandora, (2) Roku boxes use third-party services like Pandora or Mog, (3) Google TV offers the GooglePlay music store and third party service like Pandora, and (4) Xbox offers access to Microsoft's music service, Xbox Music, and third parties like last.fm and iHeartRadio. As shown in Exhibit 43, IDC expects the market for video-centric media adapters to grow at a 20% CAGR to 64mn unit shipments in 2016 from 32mn unit shipments this year.

Exhibit 43: Shipments of media adapters, such as Apple TV, Google TV and Roku



Source: IDC.

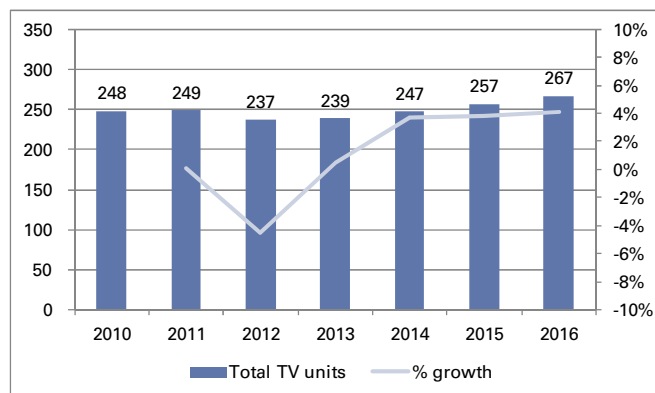
User interface is a potential opportunity for platform integration

Another possibility for near-term integration of the television into new compute platforms would be delivering cable providers video lineups as an app on a device such as the Apple TV, Google TV or Xbox. Goldman Sachs Telco analyst Jason Armstrong highlights this possibility in a September 17 report titled *Still Bullish on Cable, although not blind to the risks*. Such an agreement would give platform providers access to the customer relationship and the opportunity to become a one-stop destination for entertainment of all types. However, cable companies have differing views on ceding control of the customer relationship to a third party. As Jason Armstrong highlights, Comcast is investing heavily in its own platform and is generally opposed to opening up its APIs to third parties, and most other Cable companies appear to be similarly guarded. On the other hand, Time Warner Cable appears more amenable to working closely with technology companies and even integrating with third-party platforms. With the common view that cable user interfaces are unwieldy and dated, closer integration with a more user-friendly platform could raise cable company customer satisfaction in the near term. However, there is significant risk in relinquishing control of the user interface. Becoming just another complement on a third party's platform could potentially negatively impact viewership and might also raise the possibility of a revenue share model.

Sizing the TV opportunity

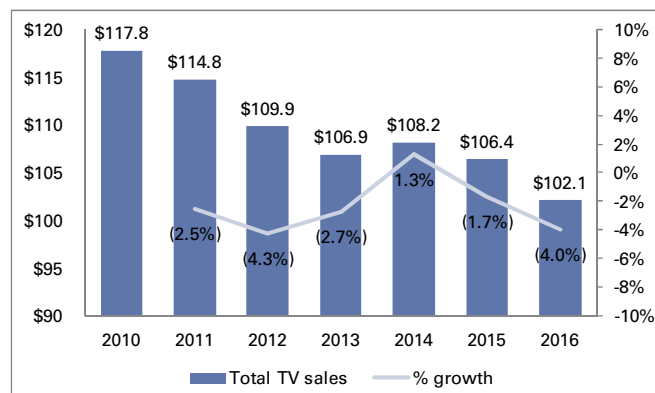
While the overall television market is very mature, the opportunity lies with the newest technologies, such as internet enablement for streaming video and web apps. As shown in Exhibits 44-45, according to DisplaySearch, the total television market will grow at a 3% CAGR to 267mn units in 2016 from an expected 237mn units this year, with revenues declining at 2% CAGR to roughly \$102bn in 2016 from \$110bn this year. In contrast to the overall market, IDC expects the network-enabled television sub-market (defined as television with integrated networking over either WiFi or Ethernet) will grow at a 26% CAGR to 124mn units in 2016 from 50mn units this year. At 124mn unit shipments in 2016, network-enabled televisions would represent just over 45% of the market (see Exhibit 46).

Exhibit 44: Global TV unit shipments, mn



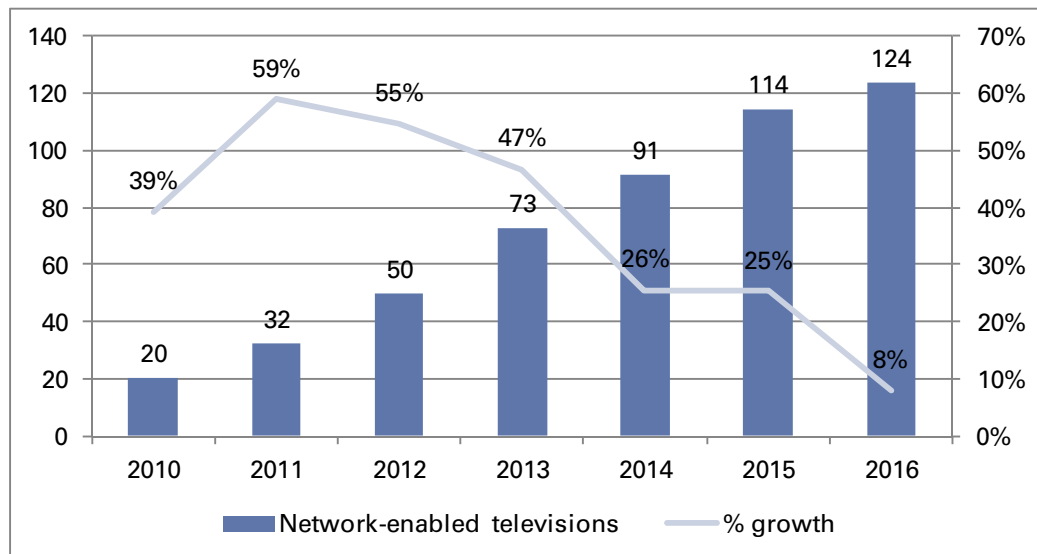
Source: DisplaySearch.

Exhibit 45: Global TV unit sales, \$bn



Source: DisplaySearch.

Exhibit 46: Network-enabled TV unit shipments forecast, mn



Source: IDC

Challenges to being successful in TV

One of the most talked-about potential consumer benefits of a possible Apple iOS-based TV (and many other so-called “over the top solutions” such as Roku and Hulu) is the unbundling of the cable package. Most of the discussion centered on the clear appeal to consumers of being able to purchase individual cable channels like ESPN or Discovery Channel on an *à la carte* basis and on the success any device that offered this capability would enjoy. However, the cable bundle has solid economics at its foundation. Looking at ESPN as an example, it is widely known that roughly \$5 of every monthly cable bill goes to Disney for the inclusion of ESPN in the bundle. Assuming roughly half of households currently subscribing to a cable bundle would pay for ESPN on an *à la carte* basis, Disney would need to charge roughly \$10 per subscriber to maintain its content fee revenue. Further, ESPN also generates revenue from advertising. In our view, there are likely to be many casual ESPN viewers who would be unwilling to pay the higher fee for an *à la carte* service, thus weighing on ratings and pressuring ad revenue. As such, ESPN would need to charge more than \$10 per *à la carte* subscriber to match the revenue it generated as part of the cable bundle. In a high cost of living area like New York City where the standard HD cable package costs roughly \$85 a month, this means consumers would be able to purchase just eight unbundled channels for the same price they pay for hundreds of channels in the bundle. Moreover, in less expensive areas an HD bundle can be as little as \$50 per month. Additionally, ESPN appeals to a broad audience for live sports, and many channels on cable have far smaller audiences for which the economics of a shift to *à la carte* pricing might not make sense. Further, for all content producers, being part of the cable bundle provides significant revenue visibility in an industry where producers’ fortunes can rise and fall based on Nielsen ratings. As such we see significant structural hurdles to unbundling the cable package.

Additionally, as the television industry stands now, it has several features which may make it less attractive to the large platform providers. First, it is a lower-margin business than the core businesses for the major platform companies. For example, we estimate Samsung Electronics’ LCD business operating margin at 5% for 2012, which compares to a 35% operating margin for Apple and a 31% non-GAAP operating margin for Google. Second, as mentioned before, replacement cycles for televisions at roughly eight years are significantly longer than the two-year useful life of smartphones or tablets. Additionally, the television business carries heavy inventory risk as well as rapid hardware commoditization. These reasons largely explain why the major platform providers have initially approached the market with television attachments rather than a full-blown television.

Vendor strategies in the TV space

Google

As is typical of Google, the company’s efforts in the television space are multi-faceted. Initially launched in October 2010, Google TV is the company’s offering in the set-top box market. It is available through manufacturing partners Vizio and Sony with their Co-Star and Internet Player devices, respectively, as well as being integrated into the LG G2 Series of smart TVs. Powered by the Android operating system, the offering combines Google’s YouTube, Google Play, and Chrome browser as well as Google TV Search and the PrimeTime recommendation engine. Also, the offering integrates with Netflix, Amazon Instant Video, HBO Go, Pandora and many other apps that deliver audio and video content streams. In our view, traction to date for this product has been limited. In our view, if Google moves to produce a fully functional television, the company would likely use an approach similar to its strategy in the handset and tablet market whereby it would partner with OEMs to deliver a Google branded product as well as licensing its software to other OEMs.

In addition to Google TV, Google Fiber is an initiative underway by the company in Kansas City, Missouri and Kansas City, Kansas that potentially could provide another avenue to greater user adoption of its consumer cloud ecosystem. With the service, the company is offering local customer much faster fiber-based internet service along with an option to add cable TV service over the same lines. While the build-out has begun, installations began for household in just one of the “fiberhood” on November 13, and Google still lacks video content deals with Time Warner (HBO) and News Corp (Fox).

Building out the infrastructure will be expensive. In his September 17 report *Still Bullish on Cable, although not blind to the risks*, Goldman Sachs Telco analyst Jason Armstrong noted that if Google devoted 25% of its \$4.5bn annual capex to this project, it could equip 830K homes per year, or 0.7% of US households. As such, even a 50mn household build out, which would represent less than half of all US homes, could cost as much as \$70bn. We note that Jason Armstrong estimates Verizon has spent roughly \$15bn to date building out its FiOS fiber network covering an area of approximately 17mn homes. The cost of ongoing test cases like this and the potential for significant cap ex investments also likely contributed to the company’s recent decision to issue non-voting class C shares in an effective stock split, in our view. Moreover, in the same note, Jason Armstrong also pointed out that Google’s TV offering represents the fifth (or higher) competitor in an already competitive market. All that said, while this initiative is clearly still in very early days, going direct to consumers with internet connectivity and video distribution could give Google the potential to become the end users sole channel for media consumption.

All in, we view the Google fiber initiative as the company’s attempt to find a way to disrupt the consumer cloud ecosystem landscape where it lags Apple’s penetration by a wide measure in the area of tablets. Given the numerous reasons we discussed earlier as to why the television could hold significant sway over consumers’ ecosystem choices, we view this as a potentially attractive avenue for creating disruption. While the company still lacks content deals with Time Warner and News Corp for its TV offering in Kansas City, over time we would expect Google to reach agreements with these companies as content providers typically welcome the prospect of new distributors in the market. As cable companies typically need to carry the same bundle channels to attract and retain subscribers, new entrants are generally just another revenue source for content companies. As for the possibility of Google using its Fiber presence to create a bidding system for television ads similar to its AdWords product for web search, in our view the content companies would be resistant to this idea. With the overall pool of US viewership relatively flat, the content companies have largely grown revenue for their networks through pricing. As such, we see them as likely unwilling to relinquish control of the current pricing process. In general, we view the current television ad buying structure with marketers buying ads well in advance at the upfronts as producing more favorable pricing for the networks and thereby reducing their incentive to explore other potential sales channels.

In executing on a TV strategy, we would expect Google to continue along its current path (similar to the path of Microsoft), where they would both sell their Google-branded hardware as well as partner with others in the Android ecosystem. We note that as with the handset industry prior to Apple and Google/Android entering the fray, the TV industry is highly fragmented, with Samsung ranked 1st at 9% and, followed by LGE at 7% and Panasonic at 3%.

Additionally, on November 17, *The Wall Street Journal* reported that Google was in early stage talks with Dish Networks about partnering on a wireless service. These discussions could be viewed as Dish signaling to the wireless carriers that it has other options for its currently unused wireless spectrum. The challenge here for Dish is that it owns wireless spectrum (which is awaiting likely FCC approval for terrestrial use) but lacks the tower infrastructure on the ground to put it to use, and as such would need to partner with a carrier such as Sprint or T-Mobile to deploy its spectrum. From Google’s point of view, a

wireless partnership would provide an opportunity to go directly to consumers with already activated Nexus phones and tablets. Sidestepping the carriers in this way would give Google greater control over the distribution and marketing of its devices. For example, it could choose to sell them as a low-cost bundle subsidized by a wireless contract in an effort to drive greater tablet share where it trails Apple by a sizeable margin. In doing so, Google would give itself the opportunity to significantly reduce the TAC rates it currently pays for tablet based searches as well as the possibility to expand media sales through its Google Play online store. Further, a wireless partnership would also give Google greater control over the user experience. Given that a Google-Dish partnership would still require a third party's towers or a build-out, in our view the talks are most likely exploratory.

Microsoft

Microsoft has been focused on its entry into the living room since the launch of the Xbox in 2001. A year later, it launched its Xbox Live subscription service by which it enabled consumers to play others online with a broadband connection. Fast forward to 2005 and the company launched Xbox360, its second-generation console, and soon afterward in 2008 it started offering the ability to stream Netflix videos through the broadband connected console, while in 2012 Amazon's Prime Instant Video services became available. We believe Microsoft will fight aggressively to garner share of the living room, and leverage what it has learned from its entertainment device experience, including its Kinect sensor. This, coupled with its recent launch of the touch-based Windows 8 operating system could be used as tools to enter this market. We would expect Microsoft to follow a strategy similar to what it has done with Surface and produce both its own smart TV as well as partner with OEMs for them to use Microsoft's operating system to power these smart devices.

Apple

Speculation of the introduction of an Apple television has existed for years, but it was not until the release of Steve Jobs' biography in October 2011 that there was any concrete evidence that any such device could actually be in the works. While the view that Apple will somehow address the television market in short order has now become consensus, the company's actual strategy for the device remains the key question mark. In its current form, the television industry is a challenge for predominantly hardware-centric vendors—longer replacement cycles relative to their current offerings (at roughly eight years, 4X that of smartphones and tablets), razor-thin margins, massive inventory risk and near-instant hardware commoditization. But long-time industry observers know that much of the same was true of the cell phone market before the introduction of the Apple iPhone, which now garners roughly 70% of industry operating profits. So when considering the entry of Apple or any other company, the monetization strategy is likely to be one of the most important factors to consider.

Despite the seeming commonalities and attempts at convergence, we think there is an important distinction between Apple's existing iOS devices and televisions. The television has historically been a **passive** and **shared** viewing device, whereas smartphones and tablets tend to be **interactive** computing devices, most often used by an **individual** (not groups) at any given time. We believe this distinction is why efforts to make televisions more interactive have so far been generally unsuccessful, and also explains why after nearly six years on the market, Apple still refers to its Apple TV product as a "hobby." With this in mind, we believe there are three possible approaches that Apple could take in attacking the market:

- **An Apple-branded television could easily be "nichey".** The general assumption is that Apple will choose to enter this market with a television set. This would be the literal interpretation of Steve Jobs' commentary from Walter Isaacson's biography in which he is quoted as saying, "I'd like to create an integrated television set that is

completely easy to use...It would be seamlessly synced with all of your devices and with iCloud...It will have the simplest user interface you could imagine. I finally cracked it." As content consumption continues to grow, it follows that iOS device users will want to be able to easily view this content on their televisions. While this can be done through peripherals today, any Apple TV user can likely attest that the experience is far from seamless; an integrated television could solve this. In addition, we believe Apple has avoided launching a television in the past because it has had a difficult time securing licenses for an appropriate amount of digital movies and television content. Nevertheless, Apple's available media content has been steadily increasing, and the company could be further along in addressing this issue. Despite these factors, however, we believe an Apple branded television could easily be niche and high-end.

- **A set-top box could reach a wider audience.** A broader penetration strategy would be a set-top box approach in which Apple partners with cable/satellite providers to deliver a set-top box to consumers. Here, Apple would be able to skirt many of the content licensing challenges that have slowed progress in the past. Nevertheless, the company would face a set of different challenges in trying to negotiate with the cable/satellite providers who vary greatly in their willingness to cooperate with third parties and many of whom have their own efforts underway to improve the user interface. With a set-top box approach, Apple would likely want to gain control of the entire user interface, which would enable it to more easily and elegantly tie live TV content with iCloud and iTunes media, as well as bring in its massive installed base of hardware devices. If Apple was able to secure relationships with enough providers, we believe this approach would allow for broader reach. Indeed, Apple would be able to marry its iOS installed base of nearly 300 million users to the massive cable/satellite TV market, which despite the rise of streaming services and alternate delivery services, remains by far the largest distributor of video content.
- **Licensing iOS to TV OEMs would be a departure, but not unprecedented.** Another possible approach to the television market would be for Apple to license its OS to TV OEMs. This would potentially allow Apple to reach the broadest possible audience, though it would be remarkably out of character for Apple given its penchant for tight device-platform integration. While we view this strategy as least likely, it is worth noting that Apple has departed from this strategy with cars. In February, Mercedes-Benz announced that its in-house "Digital DriveStyle App" would allow drivers of cars equipped with the feature to access features on their phone (including Siri) using controls on the center armrest. With the preview of iOS 6 in June, Apple announced the introduction of "Eyes Free", a new feature allows a car to bring up Siri voice control using a button on the steering wheel. Nine auto makers were announced at the time as committing to the Eyes Free Siri integration in the next 12 months, with GM recently introducing several vehicles with the feature. Apple's willingness to weaken the link between device and platform integration in this case suggests that the company could be viewing the opportunity for non-compute devices differently.

Whatever strategy Apple chooses, we believe the company is likely to treat the new product as a peripheral rather than a main device spoke, at least in the early stages. Nevertheless, we would expect an Apple television offering to be a key driver of platform value as we believe any such introduction would be made with a keen eye on linking and potentially leveraging the company's existing ecosystem and installed base of iOS users.

Samsung Electronics

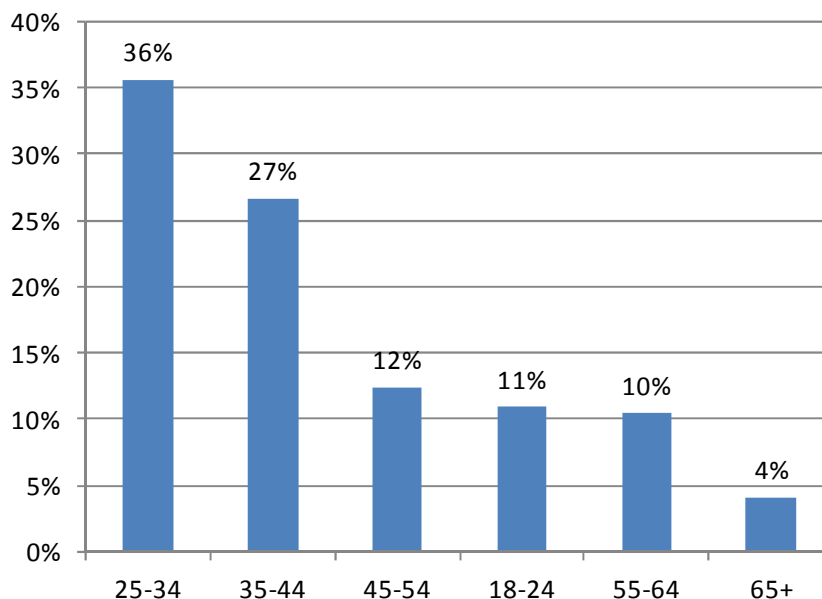
Samsung Electronics is the largest TV set maker in the world. We estimate that the company may take 20% LCD TV volume market share and 25% LCD TV value market in 2012. We do not expect Samsung Electronics' volume market share to fluctuate significantly because there are diminishing returns to pursuing higher market share. In other words, in order to increase market share Samsung Electronics would have to enter

new lower ASP/lower margin markets which may not be margin accretive for the business. Therefore, with a clear focus on higher value added TV sets Samsung Electronics introduced networked TVs quite early and has been marketing Smart TVs more aggressively in 2012. At this point, Smart TVs (from both Samsung Electronics and traditional TV set makers) feature Internet connections, streaming service apps (i.e., Netflix, Hulu), social networking services (Facebook, Twitter), and a user interface from the device maker that contains additional services and apps. In the case of Samsung Electronics, content between smartphones, tablets, and PCs can be shared with the TV through AllShare, a Samsung Electronics-designed app. Samsung Electronics' Smart TVs are a step toward making content consumption easier, but there are still many hurdles before it can be said that TVs are ready for true convergence. For example, a TV platform would need to address many issues, including app convergence on devices with a significantly larger screen size and different resolution. Therefore, we believe that Samsung Electronics will continue to work with Google and Microsoft around Smart TV platforms and solutions, but we do not expect an aggressive strategy in the near term.

Mobile survey: Pulse of 1,000 consumers

We surveyed over 1,000 people in the United States to understand their smartphone and tablet ownership, which services they use for music, videos and e-books, as well as the key drivers behind their purchasing decision for each device. The respondents ranged in age from 25 to 65+ (weighted average age of about 38 years), with a 53% / 47% female to male split (see Exhibit 47).

Exhibit 47: Age of respondents (n=1,028)



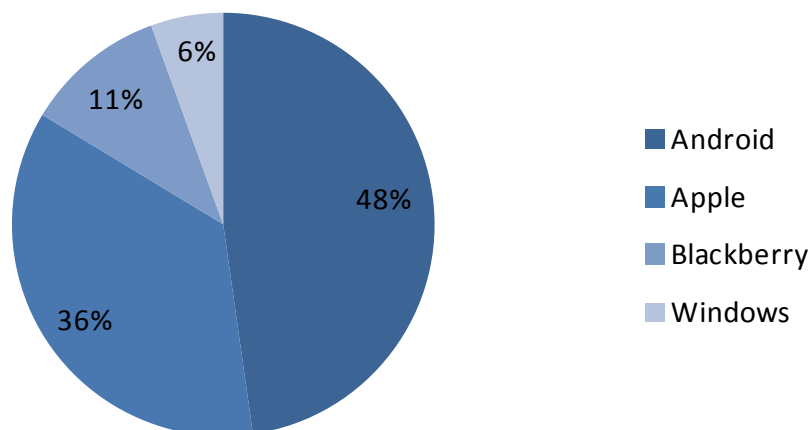
Source: Goldman Sachs Research.

Smartphones

Platforms and purchasing decisions

Not surprisingly, Android and Apple smartphones account for the large majority of devices at about 84% (Android: 48%, Apple: 36%) of the respondents. Coming in a distant third and fourth place are Blackberry (11%) and Windows (6%). This compares to our estimated installed base share of roughly 53% for Android, 18% for iOS, 9% for Blackberry, and 2% for Microsoft, based on current Goldman Sachs Research estimates and an assumed two year useful life for the devices. Each of the 1,028 respondents indicated they owned a smartphone (see Exhibit 48).

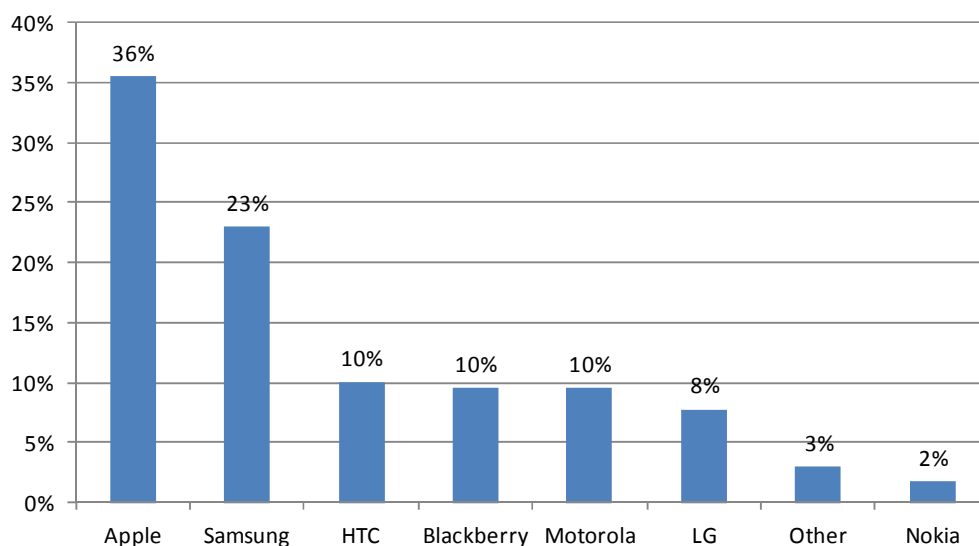
Exhibit 48: What type of smartphone do you have? If you own more than one smartphone, please think about the smart phone you use the most. (n=1,028)



Source: Goldman Sachs Research. Responses do not sum to 100% due to rounding.

Although Apple came in second place in market share by operating system as indicated in the prior question, the company placed first (at 36% share) in terms of smartphone manufacturers given the fragmentation of Android across several OEMs. Of the various OEMs using Android, Samsung held the highest share at 23%, with HTC and Motorola tying for the second position at 10%. Companies with the most number of mentions in the “Other” category included Pantech, Sony Ericsson, Huawei and ZTE (see Exhibit 49).

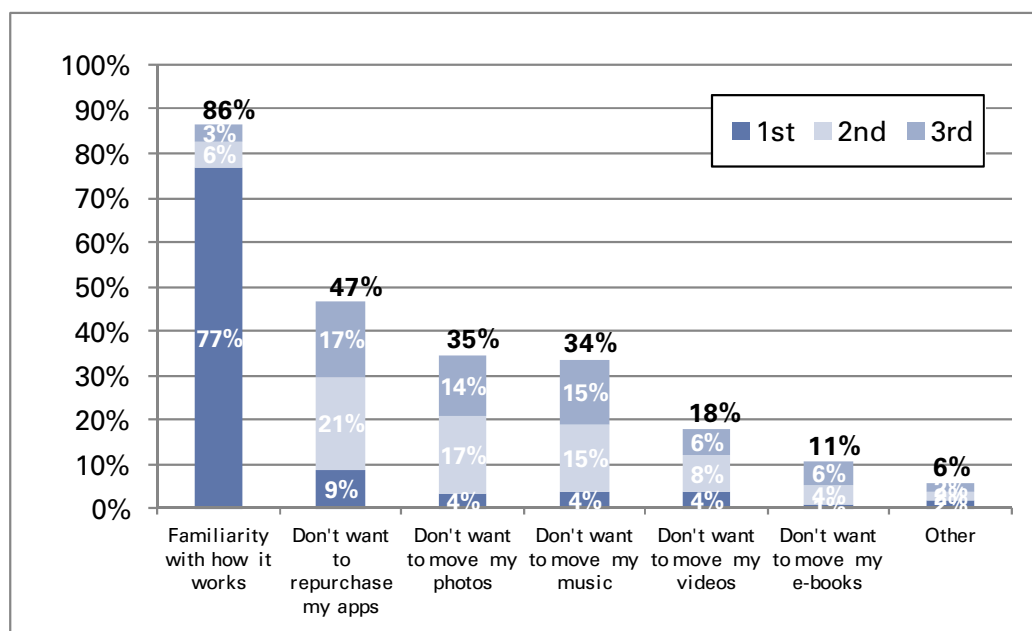
Exhibit 49: Who manufactures your smartphone? If you own more than one smartphone, please think about the smart phone you use the most. (n=1,028)



Source: Goldman Sachs Research.

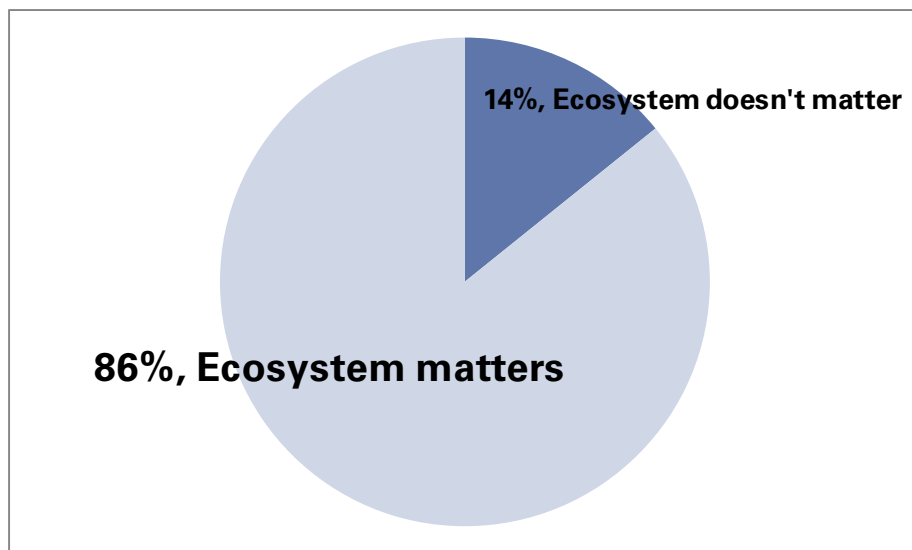
When asked about the key criteria users would consider when purchasing their next smartphone, familiarity with the user interface was the most important factor by a large margin, with 86% of respondents indicating this was one of their top three considerations. Further, a full 77% reported this was their top consideration. Nearly half the respondents (47%) indicated that the ability to continue to use previously purchased apps was among their top three decision factors. Interestingly, the respondents could have selected all of the options as driving their purchasing decision. With that said, only 9% of the respondents did so, which indicates to us that consumers have specific criteria in mind (see Exhibit 50).

Exhibit 50: For your next smartphone purchase, what would make you buy the same device again? Please rank the three most important features or select all. (n=977)



Source: Goldman Sachs Research.

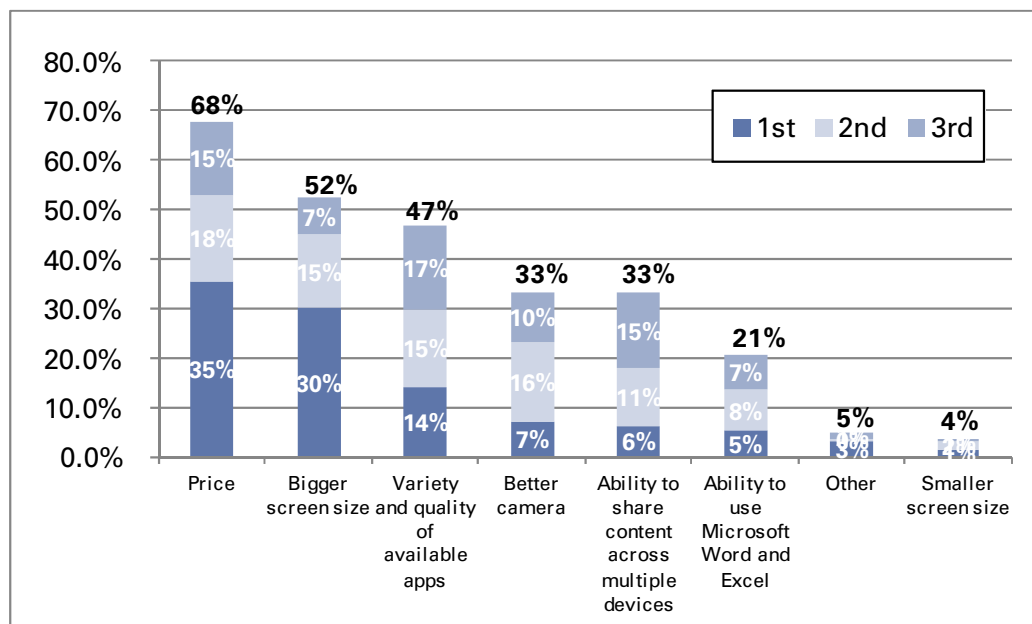
In our view these results also suggest that once a smartphone manufacturer gains a subscriber, the likelihood of retaining the user is high given the lock-in through familiarity and the inconvenience and cost of switching devices and/or platforms. In fact, we gave respondents the opportunity to indicate that their phone's ecosystem did not matter to them, and only 14% did so. While this may appear bullish for Android, we think that the lack of a leading tablet offering for consumers has the potential to drive platform defectors as once users add a tablet to their suite of devices our research strongly suggests a desire to be able to leverage their content across multiple form factors (see Exhibit 51).

Exhibit 51: Proprietary Goldman Sachs survey results show consumers unwilling to switch platforms

Source: Goldman Sachs Research.

When asked why they would change device ecosystems (e.g., change from Google's Android to Apple's iOS, or vice versa), the respondents indicated that price would be the primary reason, which was chosen as the most important criteria by 35% of the respondents. Price was also noted as a top three consideration by 68% of the respondents. We note a smartphone's ecosystem in terms of applications (top three factor for 47%) did not rank as high as price or screen size (top three for 52%). While it is worth noting that price and screen size (non-ecosystem related factors) can influence purchasing decisions, in our view the responses to the prior question suggest that user lock-in can be created through familiarity of use and device / platform switching costs. In support of this point we would again highlight Goldman Sachs Hardware analyst Bill Shope's June 29 report on Apple, *How resilient is the platform and what are the real risks?*, which outlined results from a survey of iPhone users in which the weighted average discount needed to get them to consider switching platforms was approximately 50%, or a discount range of about \$200-\$400 across the iPad product family and roughly \$50-\$200 for the iPhone. See Exhibit 52.

Exhibit 52: What would make you switch smartphone device ecosystems (i.e., Google Android to Apple iOS or vice versa)? Please rank the three most important features or select if you don't care because you don't use the phone's ecosystem. (n=908)



Source: Goldman Sachs Research.

We note the 86% of respondents indicating familiarity with their device would be a top three concern in repurchase consideration represented 844 individuals, whereas the 68% saying price would be a to factor in switching ecosystem comprised 615 individuals. In our view, the most attractive end users for a platform, those with the highest willingness to pay, likely already use high-end devices. Further, we would expect these users are unlikely to downgrade to a less robust device given the higher level of functionality they have become accustomed to. Moreover, as illustrated Exhibits 53-54, the major smartphone makers all play in the high-end market now with similarly equipped phones having relatively similar price points, and similarly equipped tablets also pricing roughly in line. As such, view familiarity with a platform as a primary factor in ecosystem selection.

Exhibit 53: Comparison of popular smartphones' prices and features

Apple			HTC		LG			Motorola			Nokia		Samsung		
iPhone 5	iPhone 4S	iPhone 4	Trophy	Windows Phone 8X	Intuition	Spectrum 2	Lucid	Droid RAZR MAXX HD	Droid RAZR MAXX	Droid RAZR	Lumia 920	Lumia 820	Galaxy Note II	Galaxy S III	Galaxy Nexus
\$199.00	\$99.00	Free	\$179.00	\$99.99	\$199.00	\$149.00	\$69.99	\$299.99	\$199.99	\$99.99	\$99.00	\$49.00	\$299.00	\$199.99	\$149.00
iOS	iOS	iOS	WP7	WP8	Android	Android	Android	Android	Android	Android	WP8	WP8	Android	Android	Android
16 GB	16 GB	8 GB	16 GB	8 GB	32 GB	16 GB	8 GB	32 GB	16 GB	16 GB	32 GB	8 GB	16 GB	16 GB	4 GB

Note: Pricing with two year contract.

Source: Verizon and AT&T websites.

Exhibit 54: Comparison of tablet prices and features

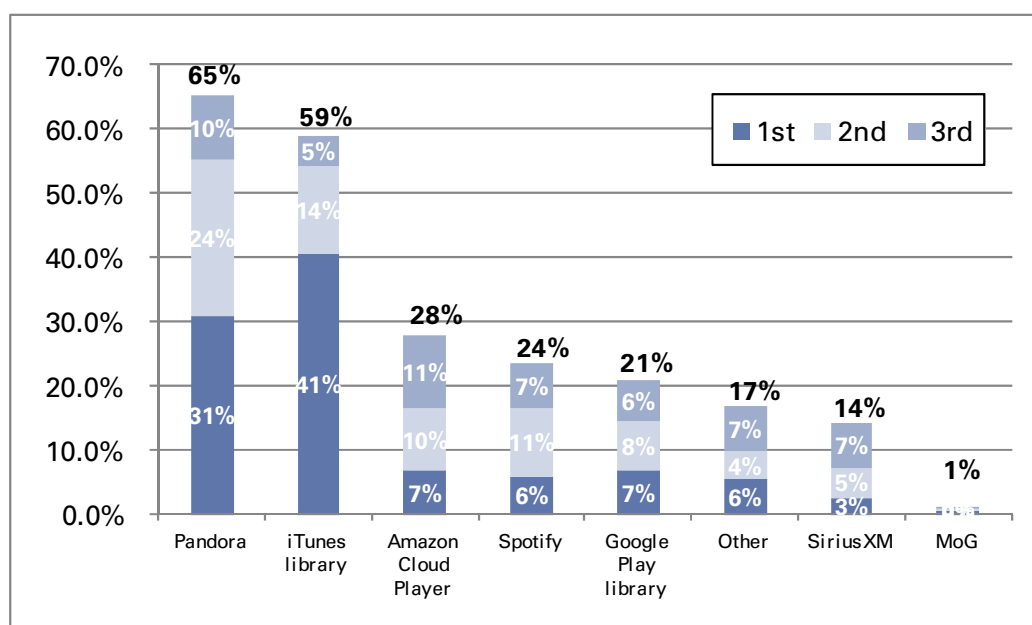
Large screen						Small screen			
Amazon	Apple		Google	Samsung		Amazon	Apple	Google	Samsung
Kindle Fire HD	iPad with Retina	iPad 2	Nexus 10	Galaxy Note	Galaxy Tab 2	Kindle Fire HD	iPad mini	Nexus 7	Galaxy Tab 2
\$299.00	\$499.00	\$399.00	\$399.00	\$499.99	\$399.99	\$199.00	\$329.00	\$199.00	\$249.00
8.9"	9.7"	9.7"	10"	10.1"	10.1"	7"	7.9"	7"	7"
16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	8G
WiFi only	WiFi only	WiFi only	WiFi only	WiFi only	WiFi only	WiFi only	WiFi only	WiFi only	WiFi only
Android	iOS	iOS	Android	Android	Android	Android	iOS	Android	Android

Source: Company websites.

Use of services (music, videos, e-books)

When asked whether they use their smartphone to listen to music, 86% of the respondents answered affirmatively. We then asked this subsegment to rank the top three music services that are used on their smartphone. Overall, iTunes was reported as the primary music service by 41% of respondents, while 59% indicated it was in their top three. Pandora was selected as the primary service by 32%, with 62% putting it in the top three. Amazon Cloud Player, Spotify, and Google Play were well behind the leaders, with 28%, 24%, and 21% of respondents, respectively, ranking them among their top three music services. In terms of the "Other" category, iHeartRadio had the most mentions followed by YouTube. While the high response rate for Pandora suggests the popularity of cross-platform music services, we view the similarly high number of responses for Apple's proprietary iTunes services as indicative of the sway platform owned and operated complements can have on users' subsequent device choices. See Exhibit 55.

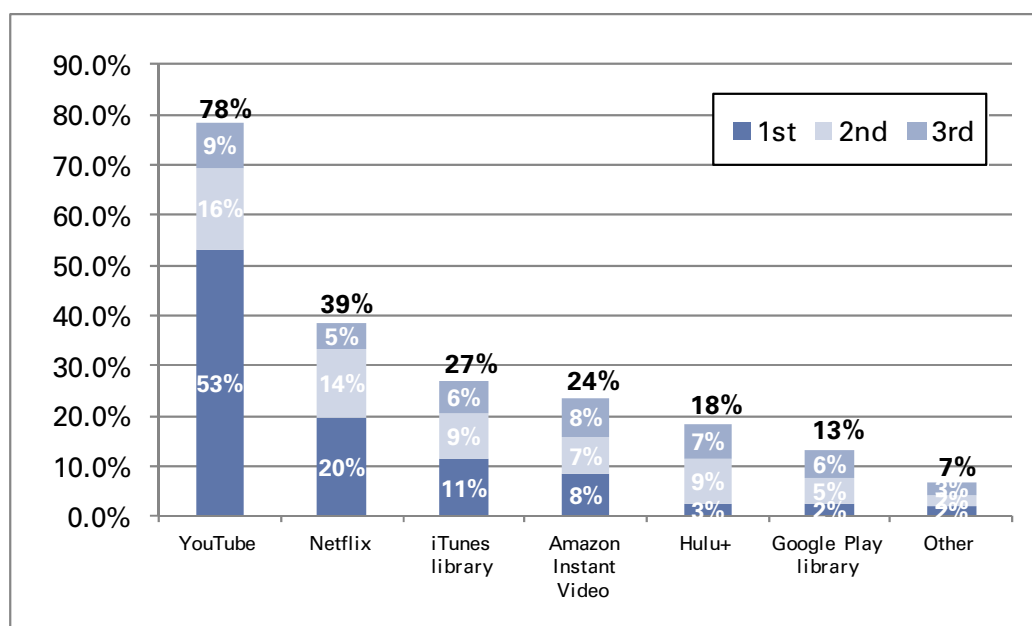
Exhibit 55: Which services do you use to listen to music on your smartphone? Please rank the three you use the most. If you use only one or two services, then leave blank those that do not apply. (n=879)



Source: Goldman Sachs Research.

Watching videos on smartphones is another popular activity, with 80% of the respondents indicating this use case. When asked to rank the top three video services, the respondents indicated that YouTube is their provider of choice. In fact, YouTube garnered the most mentions as the provider of first choice, as well as second and third. Of the total number of mentions for this question, YouTube placed first at 644, more than double the second place showing of Netflix at 317 and nearly 3X that of iTunes at 221. Given the dominance of third party complements in the video arena, we would expect video would exert less influence on users subsequent device purchases. See Exhibit 56.

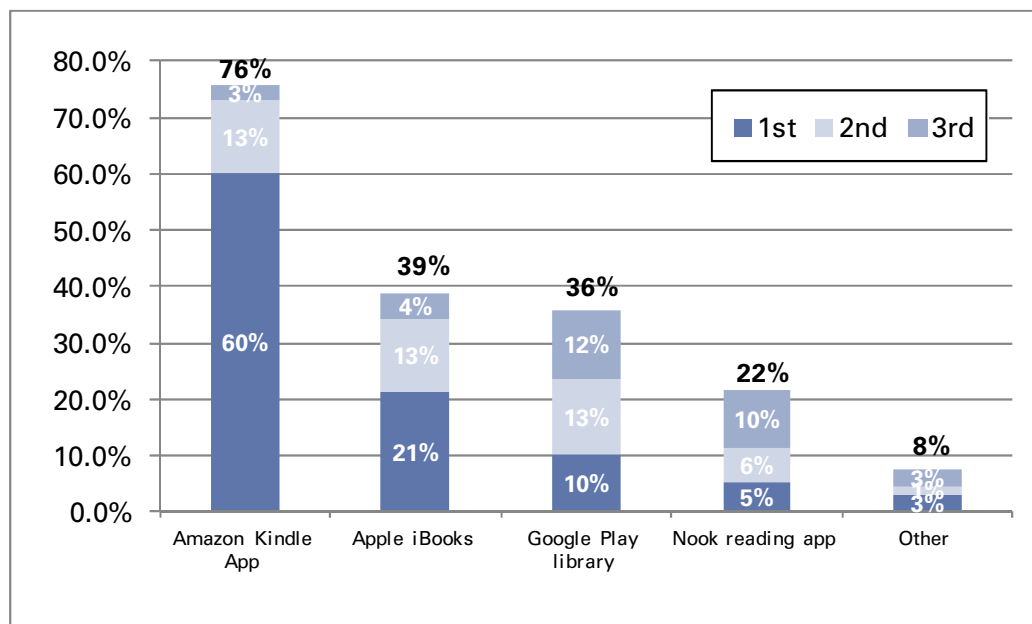
Exhibit 56: Which services do you use for videos on your smartphone? Please rank the three you use the most. If you use only one or two services, then leave blank those that do not apply. (n=822)



Source: Goldman Sachs Research.

Compared to the use of music and video services on smartphones, reading e-books appears to be a less-common use case with only 53% of the respondents indicating they use their smartphones in this way. When asked to rank the top three e-book services, the respondents indicated the Amazon Kindle App placed first, garnering 60% of the votes as their first selection. Interestingly, Google Play was ranked as the most popular service as the respondent's second choice as well as third choice. Of the total number of mentions for this question, Amazon Kindle App placed first at 415, nearly double Apple iBooks at 212 and compares to Google Play at 197. Similar to video, we would expect e-books to create relatively less platform lock-in given the dominance of third party complements. See Exhibit 57.

Exhibit 57: Which services do you use for purchasing e-books on your smartphone? Please rank the three you use the most. If you use only one or two services, then leave blank those that do not apply. (n=549)



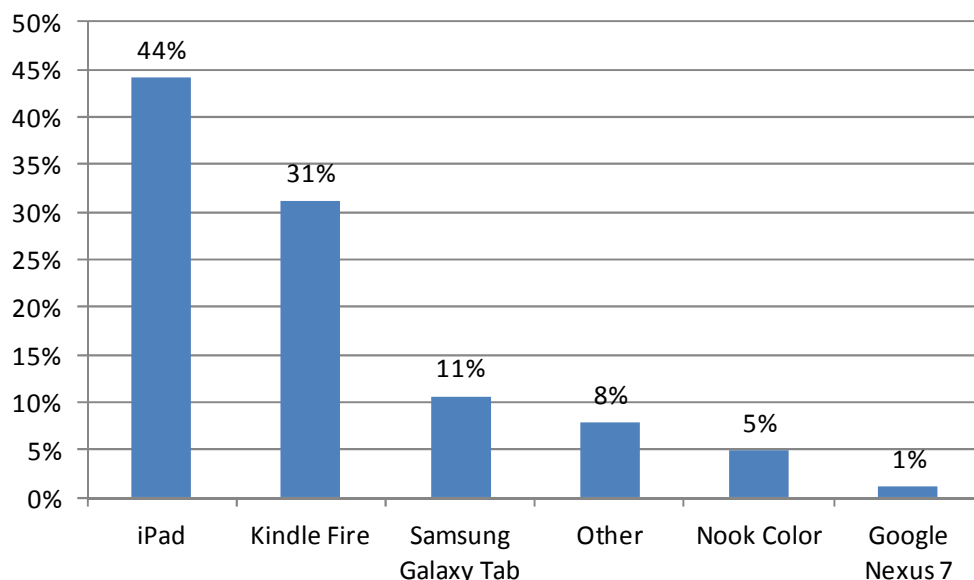
Source: Goldman Sachs Research.

Tablets

Platforms and purchasing decisions

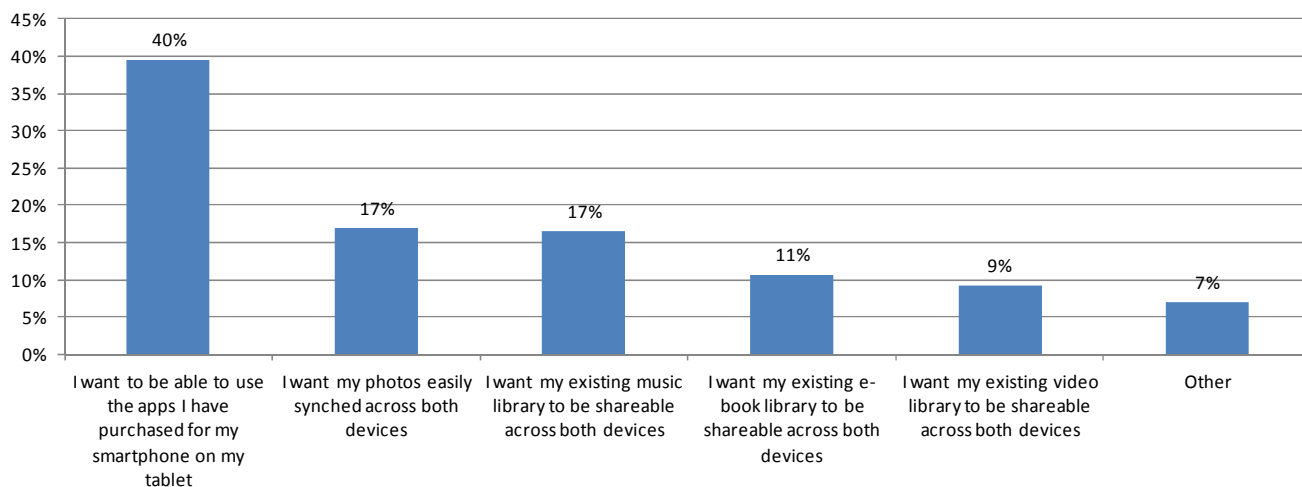
When asked whether they owned a tablet, 68% of the respondents answered in the affirmative. Of those who have purchased a tablet, the iPad was the most common accounting for 44% of the total responses, with the Kindle Fire placing second at 31%. The Samsung Galaxy Tab placed third with 11% share, while a variety of other brands were included in the "Other" category including ASUS, Acer and the Motorola XOOM. For 3Q12, IDC's tablet shipment data indicates iPad accounted for 50% of worldwide units while the Kindle Fire comprised 9% and Samsung held 13% share. See Exhibit 58.

Exhibit 58: What type of tablet do you own? If you own more than one tablet, please think about the tablet you use the most. (n=702)



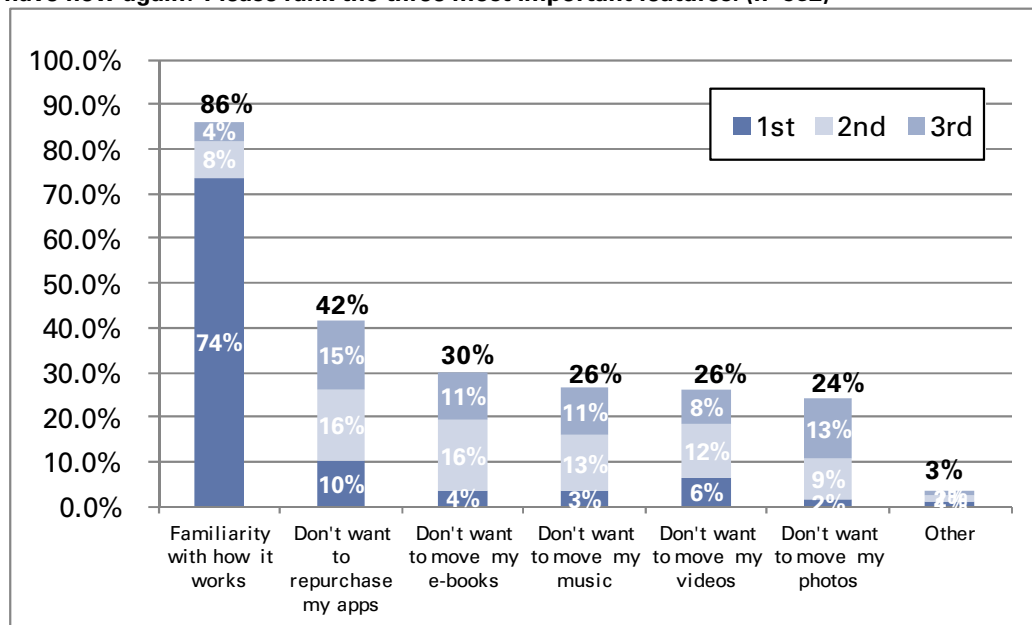
Source: Goldman Sachs Research.

We asked the respondents who do not currently own a tablet what the key criteria would be if they were to purchase one. The majority (at 40%) noted the ability to use applications across their smartphone and tablet as the most important factor. Similarly, the other key criteria were related to the ability to share content on both devices. Given the relatively greater penetration of smartphones in our survey (e.g., all of the 1,028 respondents owned a smartphone, but only 702 owned a tablet), as well as globally (Goldman Sachs is forecasting 666mn smartphones shipped in 2012 and 865 units shipped in 2013 versus 119mn tablets in 2012 and 168mn units in 2013), these results might suggest that the smartphones could serve as the anchor buying decision for tablets. However, given the popularity of iPad and nascent nature of viable tablet competition, as consumers purchase tablets, we then believe that as they go to replace their smartphone that the desire for cross device compatibility will lead people to want to have both their phone and tablet part of the same ecosystem, as discussed in detail in the section titled *The user path to standardizing on a platform* on page 30. See Exhibit 59.

Exhibit 59: If you do not own a tablet what would be the primary driver of selecting which device to buy? (n=326)

Source: Goldman Sachs Research.

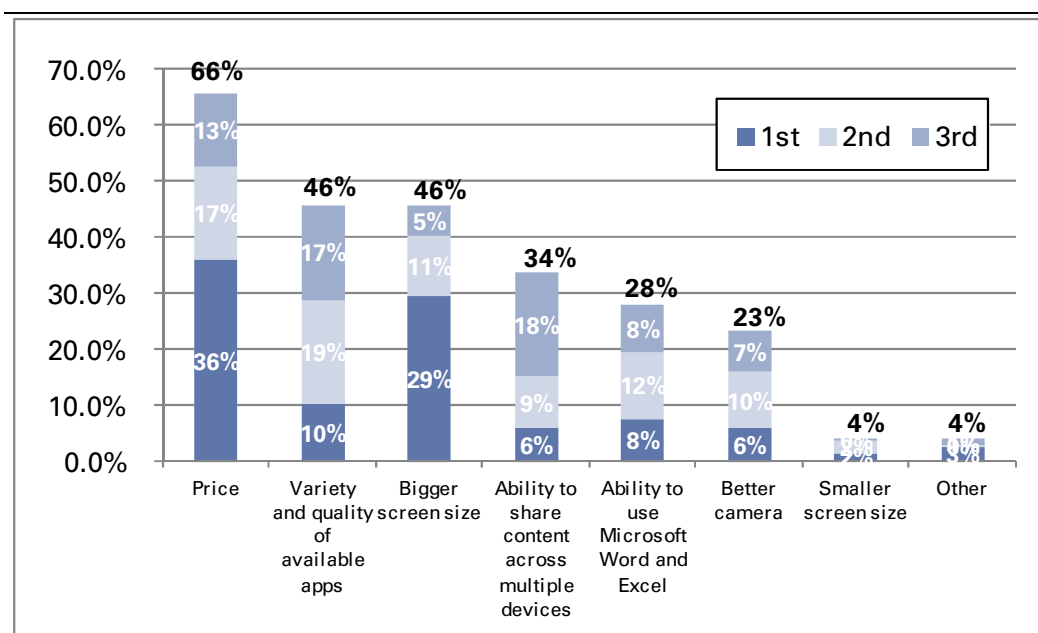
When we asked those who currently own a tablet what key factors would drive their purchasing decision for their next tablet, the large majority at 74% indicated familiarity with the user experience as their top criteria while 86% put this factor in their top three considerations. The desire to continue to use their existing applications as well as e-books was cited as a top three criteria by 42% and 30% of respondents, respectively. See Exhibit 60.

Exhibit 60: For your next tablet purchase, what would make you buy the same device you have now again? Please rank the three most important features. (n=582)

Source: Goldman Sachs Research.

When asked what would cause them to switch tablet ecosystems, the respondents indicated price is the most important factor (selected by 36% of the respondents as the most important reason), followed by a larger screen size (selected by 29% as the most important reason) and the variety and quality of applications (selected by 10% as the most important reason). Overall, participants view the ecosystem as an important criterion in device selection, with 85% of respondents reporting they cared about and use the ecosystem. As such, this means that there appears to be a place for a low-cost tablet provider to come into the market; in particular for Android, as a way of leveraging its vast smartphone installed base. That having been said, this device would be compared to Apple's iPad and iPad mini offerings in our view in terms of application breadth and quality of design. In terms of total mentions, while price and the variety and quality of apps still placed first and second at 363 and 254, respectively, a bigger screen size was not far behind in third at 252. We note that overall, the criteria that would cause a user to switch tablet ecosystems is generally similar to the criteria that would cause a user to switch smartphone ecosystems. See Exhibit 61.

Exhibit 61: What would make you switch tablet device ecosystems (i.e., Google Android to Apple iOS or vice versa)? Please rank the three most important features. (n=553)

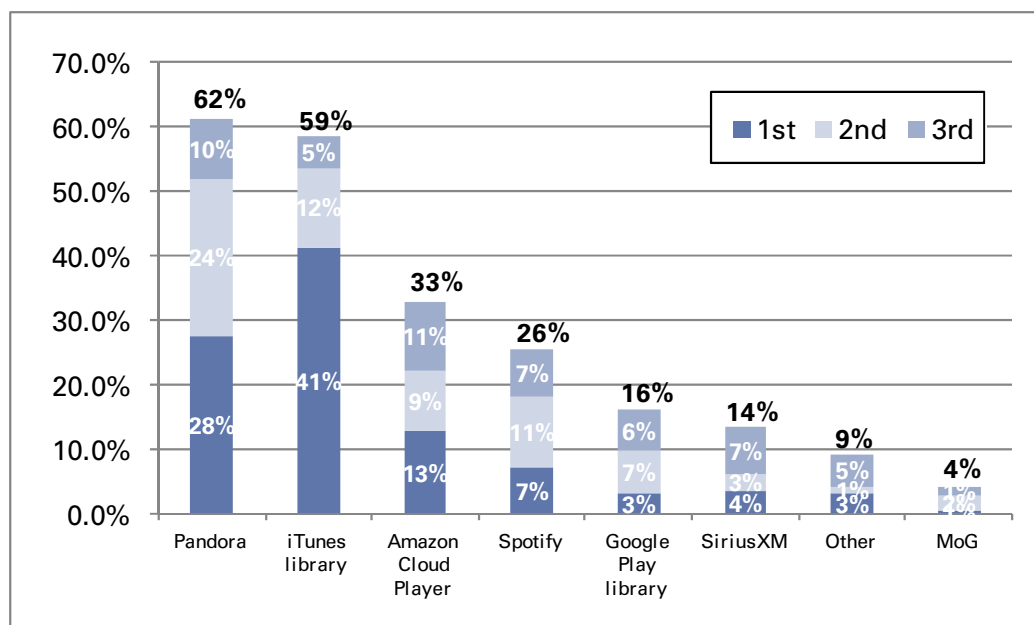


Source: Goldman Sachs Research.

Use of services (music, videos, e-books)

When asked whether they use their tablet to listen to music, 84% of the respondents answered affirmatively. We then asked this subsegment to rank the top three music services. Overall, iTunes was chosen by 41% of the respondents as their first choice. Pandora was selected by 28% as their primary music service, while the Amazon Cloud Player was chosen by 13%. In terms of the "Other" category, iHeartRadio had the most mentions followed by YouTube. Interestingly, the responses closely mirror those for music services on smartphones as well, which also suggests that consumer use both devices in a similar fashion. We note that of the total number of mentions for this question, Pandora placed first at 335, slightly outpacing iTunes at 319. Amazon came in third with 180 mentions. See Exhibit 62.

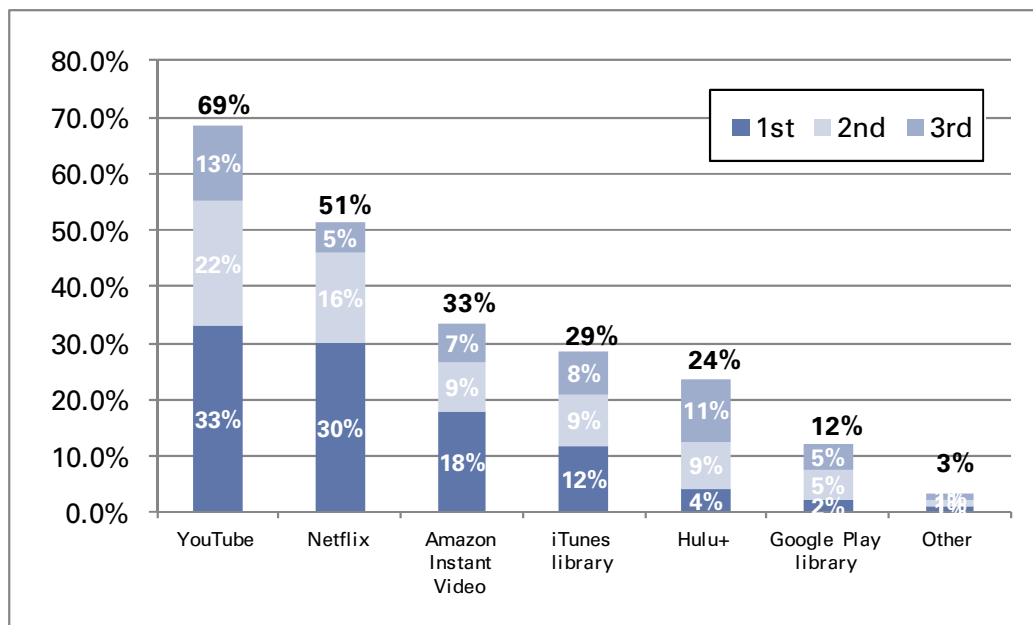
Exhibit 62: Which services do you use to listen to music on your tablet? Please rank the three you use the most. (n=545)



Source: Goldman Sachs Research.

Watching videos on tablets is more popular than on a smartphone, with 84% indicating this use case (versus 80% for smartphones). When asked to rank the top three video services, the respondents indicated that YouTube is their provider of choice. In fact, YouTube garnered the most mentions as the provider of first choice, as well as second and third choice, which is identical to the responses for watching videos on smartphones. Of the total number of mentions, YouTube placed first at 405, with Netflix in second place at 304 and Amazon Instant Video third at 197. iTunes placed fourth at 169 mentions. See Exhibit 63.

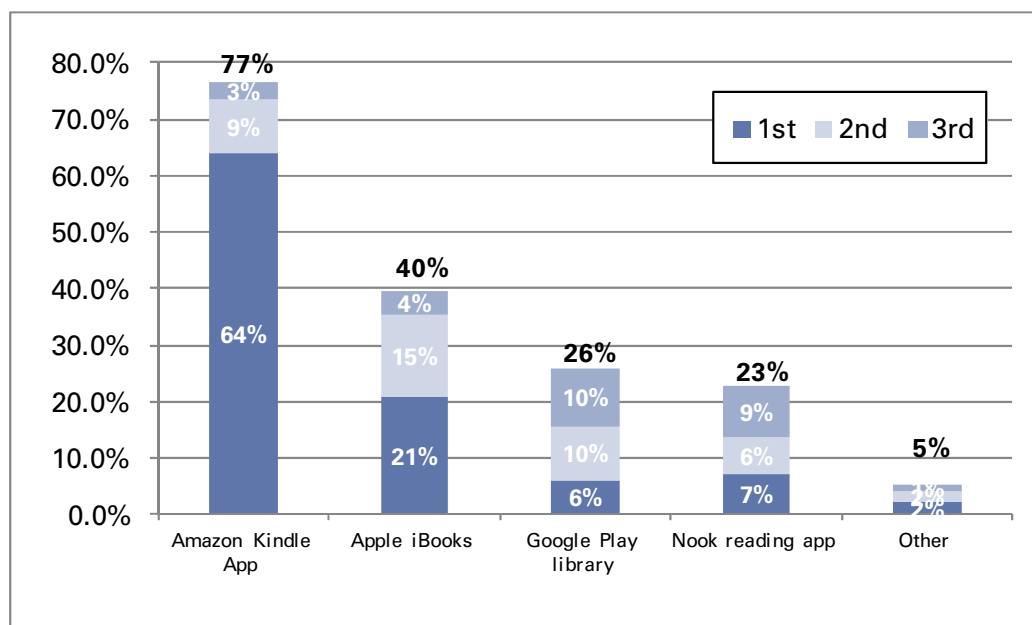
Exhibit 63: Which services do you use for videos on your tablet? Please rank the three you use the most. (n=591)



Source: Goldman Sachs Research.

In contrast to smartphones, reading e-books on a tablet is done by the large majority of the respondents, with 85% indicating this as a use case (versus only 55% for smartphones). Not surprising in our view is the lead for Amazon, with its Kindle application selected as the primary service by 64% of the respondents. Apple iBooks was cited as the most popular second choice (55%) while Google Play came in as the most popular third choice (10%). Of interest to note is the total number of mentions for this question, where the Amazon Kindle App placed first at 420 (nearly identical to the 415 mentions for e-books on smartphones). A similar situation applies to Apple iBooks which garnered 217 mentions (also nearly identical to the 212 mentions on the smartphone). Google Play placed third at 141 mentions (versus 197 on the smartphone). The nearly identical number of mentions for e-books on smartphones and tablets for Amazon and Apple also suggests to us that consumers are looking for one consistent user experience across devices. See Exhibit 64.

Exhibit 64: Which services do you use for purchasing e-books on your tablet? Please rank the three you use the most. (n=548)

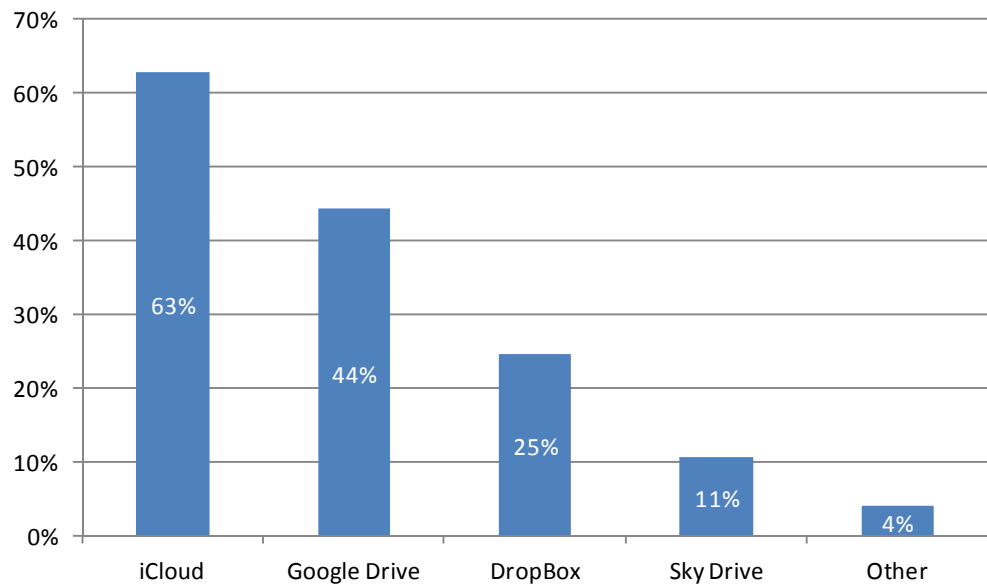


Source: Goldman Sachs Research.

Device ecosystem

The respondents indicated that the ability to share content across devices would make them change device ecosystems for both smartphones and tablets. When asked which device ecosystem they would likely use for storage and content sharing, the majority at 63% indicated Apple's iCloud service, whereas 44% indicated Google Drive. We note these results could suggest a benefit for Apple given that within our survey population the iPhone accounted for only 36% of users while the iPad accounted for 44% of users (and in reality market share is roughly 20% and 55% respectively). Given iCloud's service is limited to Apple devices, this result could imply that users of non-Apple products are considering moving to Apple. A similar situation for Google could also play out given that Android accounted for 48% of smartphones in our survey, but only 1% of tablets given the Nexus 7 and Samsung Galaxy Tab 7.0 were only recently released. With that said, as 44% of the respondents indicated they would consider Google drive as their storage / content sharing service, and given the current penetration rate of the Nexus 7, the survey results could also be a potential tailwind for Google tablets, if they produced a device that consumers found as appealing. Interestingly, Dropbox is a potential beneficiary of mobile OS fragmentation given it is available cross platform, as are its rivals Box, Google Drive and Microsoft's SkyDrive. See Exhibit 65.

Exhibit 65: You said that the ability to share content across multiple devices would make you switch device ecosystems. Which file storage/content sharing services are you most likely to use? Please check all that apply. (n=522)



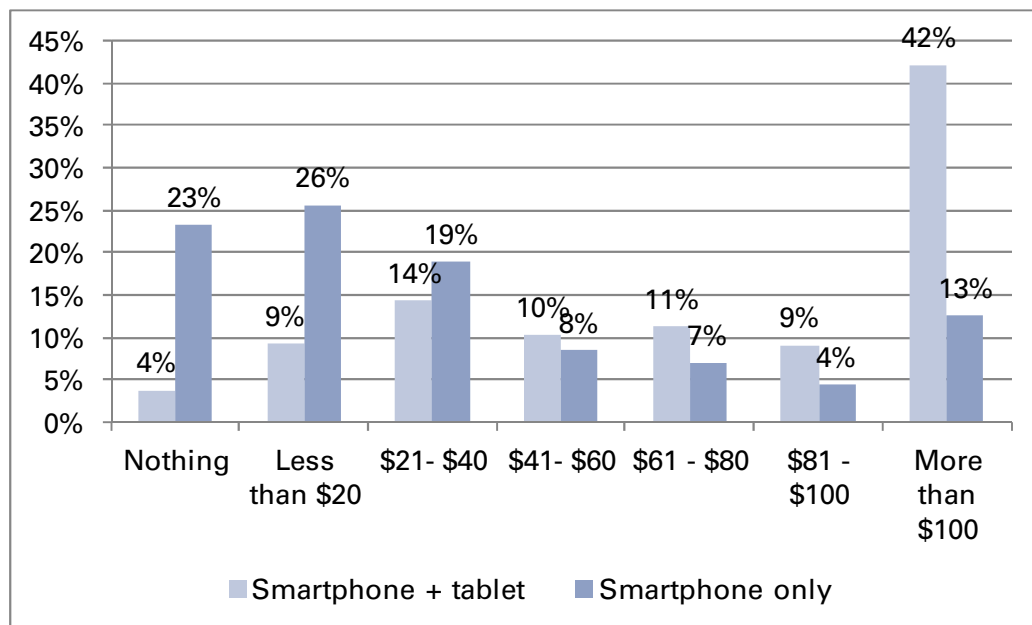
Source: Goldman Sachs Research.

Spending habits

Not surprisingly, tablet owners report spending more than respondents who only own a smartphone, and iPad owners generally spend more than other tablet owners.

We asked how much users are spending to consume content on their tablets and/or smartphones over the prior 12 months. Nearly 50% of smartphone only owners reported spending less than \$20 or nothing on media and apps in the last 12 months, whereas 42% of those who also own a tablet reported spending more than \$100 on media and apps in the last 12 months. See Exhibit 66.

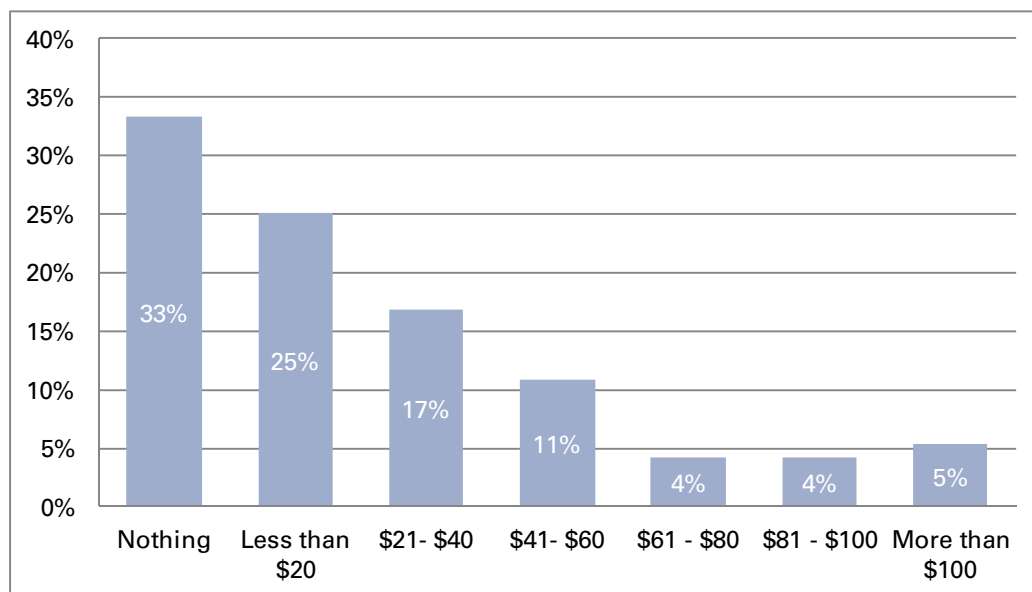
Exhibit 66: Respondents who own a tablet and smartphone spent more than those who just own a smartphone



Source: Goldman Sachs Research.

For e-books, roughly a third of respondents reported spending nothing in the prior 12 month period, with the weighted average TTM spend among the balance of survey participants being \$39. Not surprisingly, at an average \$41 over the last 12 months, Kindle Fire owners spent more than other tablet users. The average spend on ebooks across all tablet owners was roughly \$33. This compares respondent who only own a smartphone at just over \$10. See Exhibit 67.

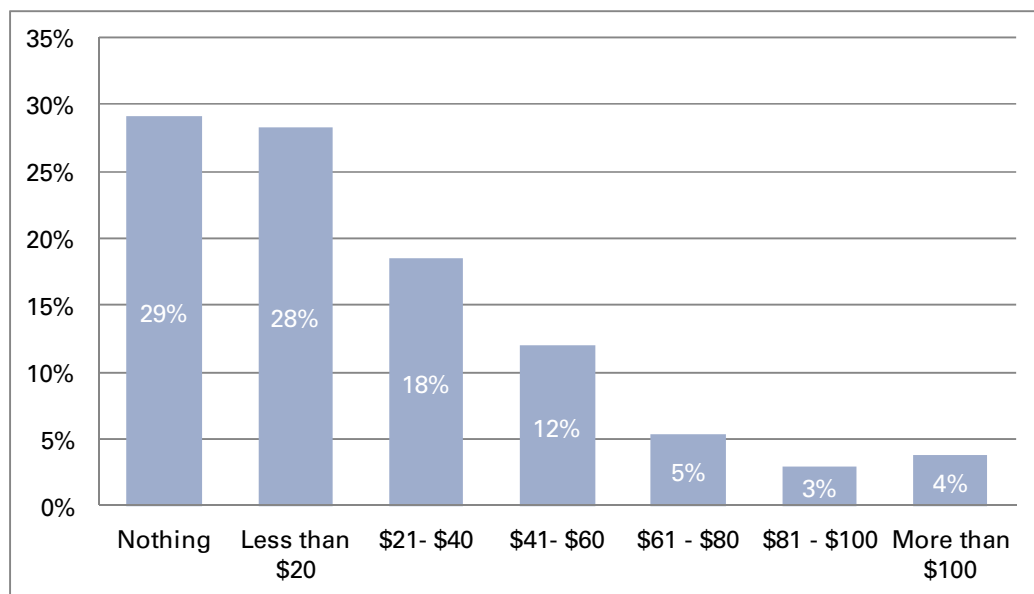
Exhibit 67: On your tablet and/or smartphone, how much money do you estimate you have spent on e-books over the prior 12 months? (n=1,028)



Source: Goldman Sachs Research.

The results for music suggest the continued popularity of streaming music services such as Pandora and Spotify. In fact, Pandora was the most popular music listening application, with roughly 65% stating it was ranked as one of their top 3 choices. Just under 30% of respondents indicated they had not purchased music on their devices in the last 12 month, and the weighted average spend among buyers was \$35. iPad owners spent roughly \$35 on average, compared to \$20 for all tablet owners and around \$13 for smartphone only owners. See Exhibit 68.

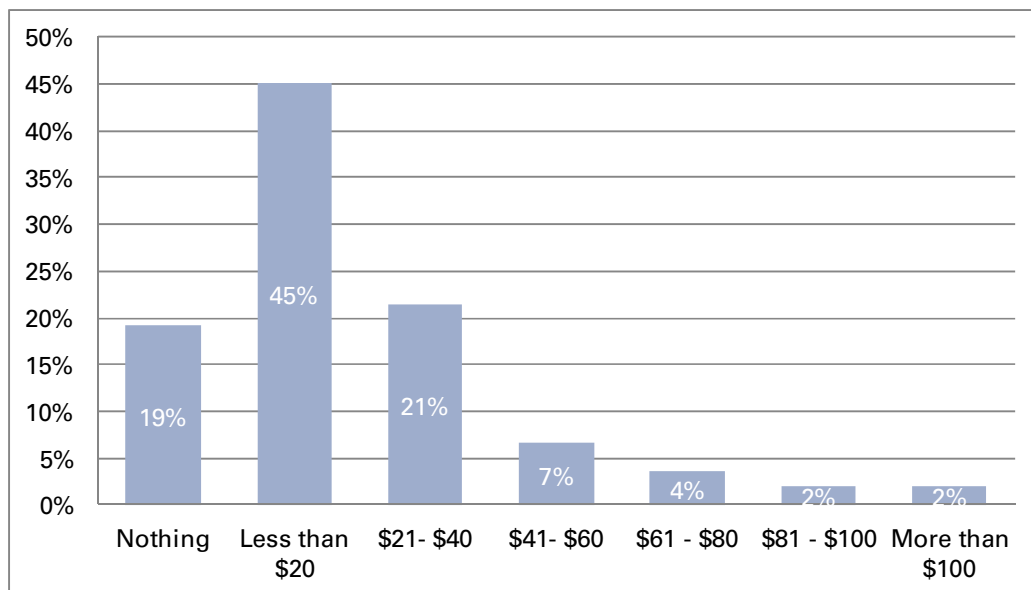
Exhibit 68: On your tablet and/or smartphone, how much money do you estimate you have spent on music over the prior 12 months? (n=1,028)



Source: Goldman Sachs Research.

Applications presented a different story, where the majority at 45% indicated they spent \$20 or less over the past year. Again, iPad owners spent more than others at roughly \$30 on average, compared to \$25 for all tablet owners and just under \$15 for smartphone only owners. See Exhibit 69.

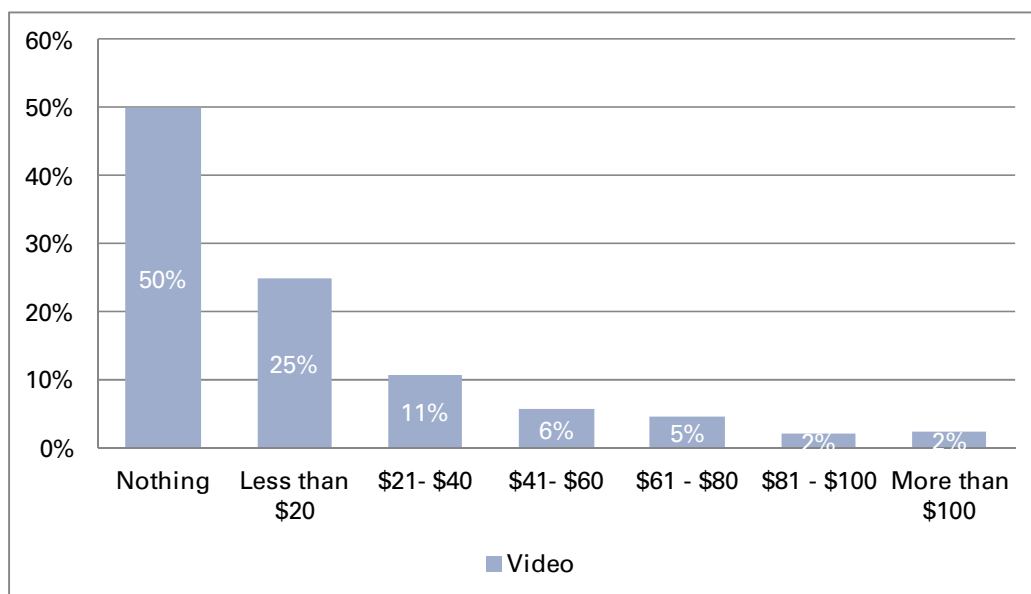
Exhibit 69: On your tablet and/or smartphone, how much money do you estimate you have spent on apps over the prior 12 months? (n=1,028)



Source: Goldman Sachs Research.

Given free video services like YouTube, we are not surprised to see half of our respondents report not spending anything on video on their devices. Yet again, iPad owners were the highest spenders. On average, they spent roughly \$24 on video in the last 12 months compared to the average tablet user at roughly \$21 and smartphone only users at \$6. See Exhibit 70.

Exhibit 70: On your tablet and/or smartphone, how much money do you estimate you have spent on videos over the prior 12 months? (n=1,028)



Source: Goldman Sachs Research.

Appendix: The early platform wars (Apple, Commodore, Microsoft)

In the early 1970s, a team at Intel invented the microprocessor, which was a single chip capable of computing power previously found only on mainframes the size of large rooms. This technological leap finally made the personal computer feasible. However, the microprocessor still required an operating system to manage the computer's hardware resources. The fight amongst operating systems vying for dominance in the 1980s was one of the first conflicts between open and closed systems in the information era. The adoption of a dominant standard was inevitable as software was not compatible between operating systems and software development and distribution costs were high.

The early market: Apple and Commodore

While early attempts at creating a consumer product failed in the marketplace, the appeal of possibly creating a computer for the mass market resulted in the formation of PC companies such as Commodore and Apple. These two companies adopted a closed approach, in that they developed both the hardware and operating system in house.

Apple was founded in April 1976 and released its first mainstream success, the Apple II only a year later. While sales of the system were initially sluggish, only selling 600 machines in 1977, sales eventually picked up after an aggressive marketing campaign and the release of popular software. What really led the company to mainstream success was the release of VisiCalc in 1979, the original spreadsheet application. This program is often considered the application that transitioned the microcomputer from a niche product to a mainstream enterprise product. In 1978, Apple only sold 7,600 machines, but after the release of VisiCalc the company gained popularity and sold nearly 210,000 units in 1981. All of Apple's computers used proprietary operating systems developed in-house. Steve Jobs decided early on that Apple would not license its OS to other OEMs as he felt that doing so would diminish the user experience and the Apple brand. As a result, the company treated the hardware and the operating system as a united product and rejected Bill Gates' attempts to separate the two.

Commodore International, which originally started as a manufacturer of calculators, entered the computer market in 1977. It began selling and marketing computers at much lower prices than their competition, targeting the average consumer rather than enterprise customers. However, the company only gained prominence with the release of its Commodore 64 computer in 1982. The inexpensive price and successful sales strategy drove initial customer adoption, while the superior hardware, with favorable sound and graphical specifications, encouraged software developers to create programs for the Commodore system. Once quality software was released for the system, its sales spiked. Accounting for nearly 4% market share in 1980, the company captured nearly 37% share by 1985. Commodore, like Apple, used an in house operating system and chose not to license it to other OEMs.

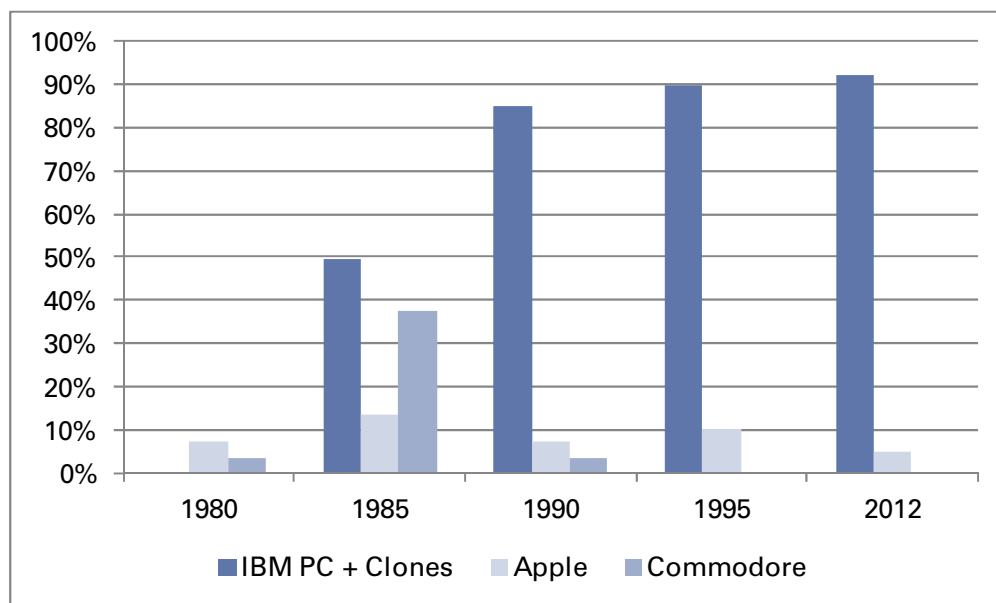
The entrance of Big Blue and the "Attack of the Clones"

IBM was late entering the microcomputer market and, in rushing to release its version of the PC in late 1981, was forced to contract the operating system out to Microsoft (founded in 1975) and the processor to Intel. The only proprietary part of the IBM PC was the ROM BIOS (read only memory, basic input, output system), which controlled the keyboard, display screen, disk drives, and other miscellaneous functions and proved relatively easy to reverse engineer. As IBM used off-the-shelf hardware and a third-party operating system, its PC was relatively easy to replicate. In fact, it took less than a year for legal clones of the IBM PC to hit the market (starting with Compaq in 1982). Microsoft licensed its operating

system to the hundreds of IBM PC clones. Sales of IBM PCs exploded starting in 1983 as enterprise customers, reassured by the IBM brand name, began buying microcomputers. Microsoft's open system and the size of its install base attracted software developers to the MS platform, which in turn drove further customer adoption. Microsoft grew from having no footprint in the market in 1981 to controlling 49% (3.7 mn units) in less than four years and 90% of the 367mn unit market in 2011. See Exhibit 71.

Exhibit 71: PC Market Share by shipments

While Apple and Commodore were able to gain early prominence in the personal computer market, the IBM PC + Clones, running Microsoft's operating system, were able to eventually overtake them as AAPL and CBM suffered from limited software development.



Source: Jeremy Reimer, Total Share: 30 years of personal computer market share figures; Goldman Sachs Research estimates.

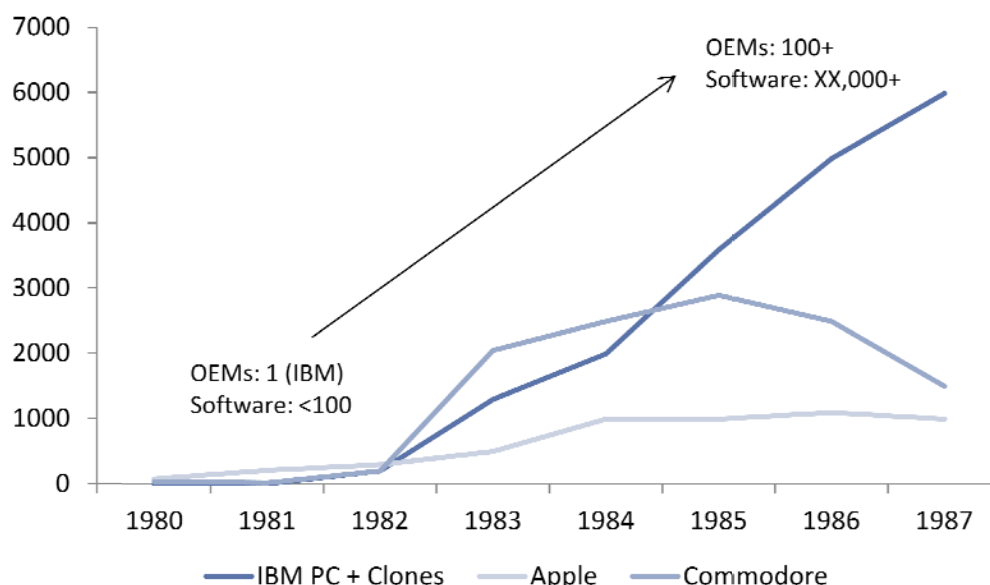
The key failure of closed systems – limited hardware platforms

While Microsoft was able to insulate itself from the success or failure of individual products by distributing its platform via a variety of OEMs who used off the shelf components, Apple's computers relied on a series of proprietary components (e.g., Motorola processors, Apple print drivers, etc.). This decision tied Apple to a small hardware ecosystem and made it more susceptible to the success or failure of individual products. The closed nature of Apple and Commodore's platforms limited the number of hardware devices running their respective operating systems, which meant that the failure of one of their devices in the market would greatly affect share. Apple and Commodore continually faced this problem. While Apple released the incredibly popular Apple II in 1977, it took the company nearly seven years to offer another product that the market deemed worthy of replacing it. During that seven-year period, Apple released the Apple III, which suffered from engineering flaws and had to be recalled, and the Apple Lisa, which was too expensive for the mass market (\$9,995 in US dollars in 1983). While Apple finally released the extremely popular Apple Macintosh in 1984, the damage had already been done and both Microsoft and Commodore had overtaken Apple's early advantage in the PC market.

Commodore suffered from a similar malady as the company was unable to replicate the commercial success of the Commodore 64. While it released the Amiga to succeed the Commodore 64 in 1985, the Amiga was unsuccessfully marketed and was slowed by prolonged patent battles with Atari. In the end, Commodore failed to provide a commercial

successor. As the technology of the C64 grew outdated, the company lost market share at an incredible rate. While Commodore held a 37% share of the market in 1985, by 1990 its market share had plummeted to less than 4%. The rapid loss in revenues threw the company into a financial spiral that ended in its bankruptcy in April 1994. See Exhibit 72.

Exhibit 72: PC shipment by operating system (in thousands of units shipped)



Source: Jeremy Reimer, Total Share: 30 years of personal computer market share figures; Goldman Sachs Research estimates.

Microsoft – From sea to shining sea

Microsoft and its OEMs took advantage of the troubles facing both Apple and Commodore and captured a major portion of the market. As Microsoft grew in share, software developers flocked to its platform, pushing sales of Microsoft's operating system even higher. By 1990, Microsoft had captured nearly 85% of the market and emerged as the victor in the PC platform wars. Today, Microsoft's dominance is even more apparent, as descendants of the IBM PC currently occupy 92% of the market, although the introduction of Apple's iPad in 2010 and Android-based tablets means that Microsoft's share of total compute has actually now faced a headwind. Tablets are expected to be 25% of total compute in 2012, with Apple dominating this market since the release of the iPad in 2010 with 62% share of Media Tablets in 2011, as noted by Gartner, October 17, 2012, with Google/Android taking 35% share in 2011 (Gartner, October 17, 2012), generally due to Amazon Kindle Fire and Google Nexus. While Windows 8 was launched just at the end of October 2012, we think it will take several quarters to determine whether or not this release will help Microsoft gain material market share, which we would estimate as greater than 20-25%.

In retrospect, there were three main factors that led to Microsoft's platform dominance:

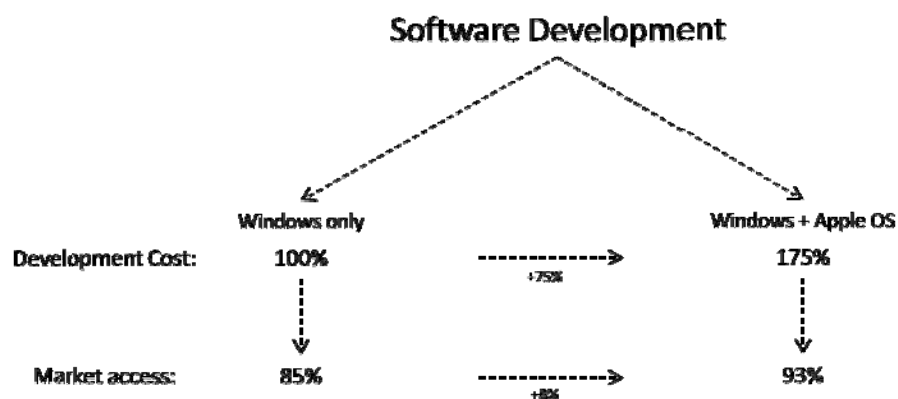
1. **The IBM brand name was key to Microsoft's early success.** Enterprise customers, who formed the majority of the early PC market, were willing to purchase microcomputers from IBM, as the company had previously built a rapport with businesses as a leading provider of enterprise mainframes. Microsoft was able to gain a strong foothold in the market (starting with its 1981 release) by offering an enterprise

product, while Commodore was targeting the still nascent consumer market and Apple was suffering from an aging Apple II hardware platform.

2. **Microsoft's decision to license its operating system ensured it would constantly have a diverse offering of hardware platforms.** Microsoft was able to bypass several problems that plagued both Apple and Commodore by adopting an open system. A licensed OS ensured that numerous OEMs would produce Microsoft-based computers, diversifying its hardware options and insulating the company from the success or failure of any specific hardware device. As a result, when an unsuccessful product was released, customers could change out their hardware, rather than changing operating systems. Product diversity allowed Microsoft to avoid share loss resulting from the lack of a successful hardware platform – a weakness that Apple suffered between the release of the Apple II and the Macintosh (1980-1984) and Commodore suffered following the release of its C64 (1986-1994). In fact, we believe that Microsoft's diverse hardware offerings allowed it to steal share from these companies when their hardware platforms were weak.
3. **Microsoft benefited from a software "network effect."** As software development and distribution costs were high, openness helped attract the relatively scarce software content available. As the software offerings for the MS-OS system grew, customers flocked to the platform, which in turn provided software developers an even greater incentive to publish Windows compatible software. This created a self-perpetuating cycle: the larger the install base, the more software offerings, the larger the install base. When Microsoft reached 85% market share in 1990, developers had almost no incentive to write software for Apple or Commodore as the Microsoft platform offered access to a much larger market. In addition, porting costs were relatively expensive in the 1980s and rewriting software for a second platform incurred around 75% of the original cost of development (see Exhibit 73). As Microsoft's share grew, the benefit of co-developing software diminished, leading developers to write programs solely for the Microsoft platform.

Exhibit 73: Software porting costs discouraged cross platform development, 1990

As Microsoft gained share, the incentive for porting software between platforms diminished



Source: Jeremy Reimer, Total Share: 30 years of personal computer market share figures; Microsoft; Goldman Sachs Research estimates.

While the IBM brand name drove its original success, Microsoft's openness ensured that it would succeed over the closed systems of Apple and Commodore. The company was able to gain share during periods of hardware trouble for its competitors and left them all behind as software developers flocked to their platform. In retrospect, Microsoft's success was the result of its choice to license its operating system.

Online Search (AOL, Yahoo!, and Google)

Just as Microsoft's success was helped by the diversity of hardware OEMs who had chosen to license its OS, Google was helped by the diversity of content producers that emerged during a key growth phase of the web in the mid-1990s.

Widespread internet adoption, starting in the mid-1990s, placed an unprecedented amount of information at the fingertips of the user. However, while the internet made information more accessible, finding relevant information in an efficient manner proved to be quite difficult; this led to the advent of web portals and search engines. Yahoo!, which was founded in 1995, was one of many companies that attempted to overcome these challenges. The company began manually indexing web pages to create a searchable directory. However, Yahoo!, like many of the other early search engines, was organized as an internet portal and information aggregator.

Because the early internet lacked quality news, media, and information providers, Yahoo! aggregated quality content on its website. Like AOL, Yahoo! created a "walled garden", seeking to keep users on its site to simplify their browsing experience. These internet portals were so successful that many individuals believed that AOL or Yahoo! were the entire internet. While Yahoo! offered a search engine, it tried to fulfill the needs of all its visitors on its own website. At that time, search capability was not the core function of the business, but rather an additional feature.

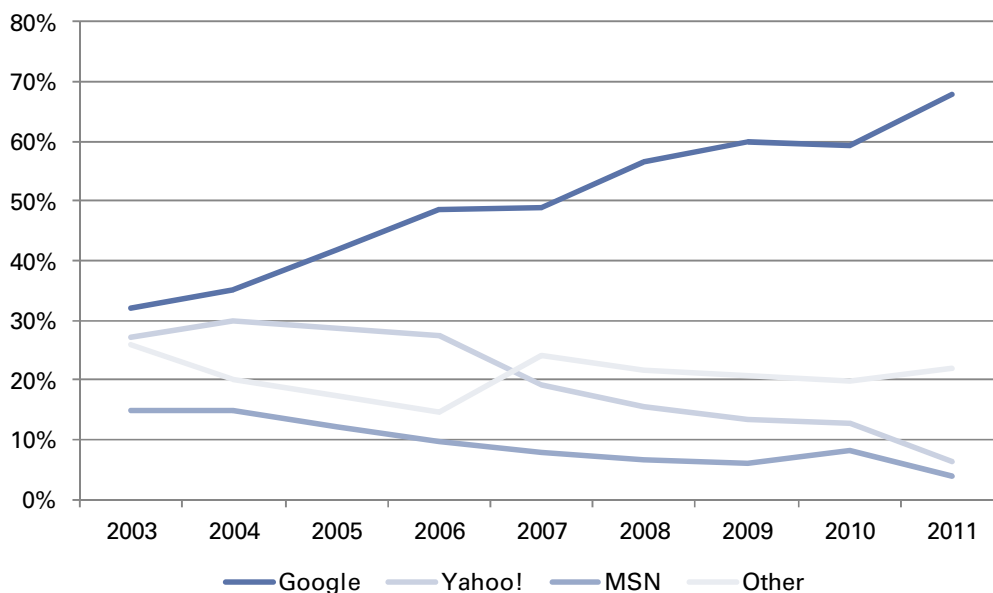
The modern search engine: Google and PageRank

Web portals grew and prospered in the early years of the internet, but were only successful due to the lack of quality content available offsite. However, as the internet grew in popularity, a greater amount of quality content started to migrate online. Internet users preferred to consume content on sites that specialized on a topic, such as ESPN in sports, rather than using a generalist web portal like Yahoo!. As internet users started to transition from consuming content on web portals to consuming content on the general internet, they looked for a more efficient method of finding what they wanted. They found their tool in Google's search engine. Google benefited from this rapidly growing adjacent search market that Yahoo! and MSN missed.

Google, founded in 1998, radically changed the way that users interact with the web. Assuming desirable content was linked to more often, Google used web crawlers to automatically index and then rank websites by the number and importance of pages that linked back to the site. In fact, when it was founded, the company was capable of creating an index of 26 mn pages in a couple of hours, and today the company processes the web's one trillion URLs several times a day. Google's formula to determine content relevance was a significant advantage over the existing search engines, which used unranked, hierarchical directories. Not only did Google have more relevant search results, it focused on sending users offsite to quality providers of content, opening up the internet to an eager audience. Rather than adopting the web portal model used by Yahoo!, Google used a minimalist interface and focused solely on search. See Exhibit 74.

Exhibit 74: Google share of total online searches, 2003-2011

Google's explosive growth in the early 2000s was driven by its superior search technology and rejection of the closed portal model of online search.



Source: comScore, Goldman Sachs Research estimates.

Internet users quickly adopted Google's search engine and the company grew its share of the search market from 0% in 1998 to 32% in 2003. In fact, Google's search algorithm was so much better than its competitors' that it was hired to power both Yahoo! and MSN search results from 2000 to 2004. Yahoo!'s shortcoming was that it tried to be everything to everyone; a "one stop shop" for the internet, when in reality users sought out sites with best of breed content. For example, Google did not compete with Yahoo! Sports or Movies, it offered access to ESPN and IMDB.

Search monetization

Google was also the first company to successfully monetize search. Before Google's pay-per-click model, search engines were funded by ad banners. These proved to be relatively ineffective and counter-productive. Google adopted a new model that sold ads in an auction, which factors in bid price and ad click-through rate. This system resulted in both better ROI for advertisers and profitability for Google.

Google's long-term success

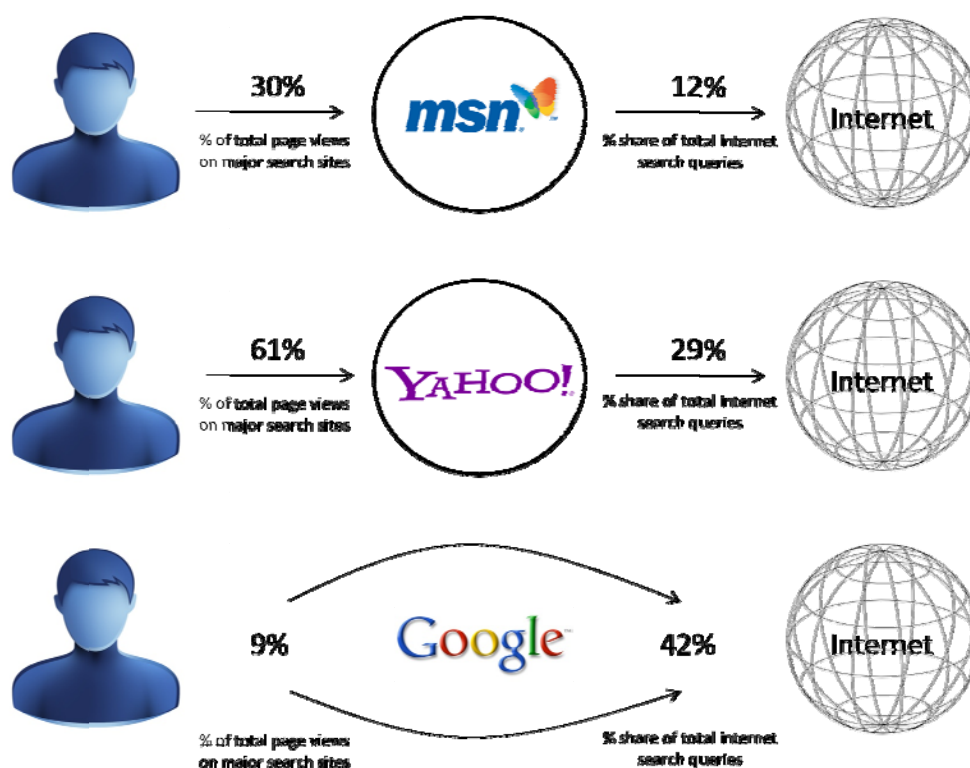
While Google's search algorithm originality allowed it to gain a significant share of the search market, it was logical to assume that Yahoo! and MSN could recapture a significant share once they developed their own algorithmic search. This, however, did not prove to be the case as Google itself became a verb and embedded into people's workflow. Between 2000 and 2002, Yahoo! attempted to strengthen its search capability by acquiring Inktomi and AltaVista. These acquisitions combined with internal R&D allowed Yahoo! to transition off of Google's search engine in 2004. However, even though the company developed a search algorithm comparable to Google's, it remained unable to retake share. MSN search was also forced to use Google until 2004 when it released its own internally developed search engine. However, its share remained relatively small, even after the

launch of Bing in 2009. Google's ability to maintain its vast market share, despite the efforts of Yahoo! and Bing, indicates that the company has been able to successfully lock in users. For all intensive purposes, Google has become synonymous with online search and using it has become second nature for many individuals. Yahoo! and Bing have found it incredibly difficult to break into the unconscious habit of typing in google.com. While Microsoft has gained share with Bing, we note that Google's share of US searches has stayed relatively constant at 65% of the market, while the remaining competitors in the space have fought for the rest, with Microsoft primarily taking share from those providers.

Google was successful because of its superior algorithm-based approach as it opened the internet to the general public by sending users offsite to sites better suited to fit their needs. Closed web portals, such as Yahoo!, AOL, and MSN, saw significant declines as users migrated to the open internet. Past conflicts between open and closed systems have made it unmistakably clear that platform isolation poses serious risks and that no single company can fulfill all the needs of a platform's ecosystem (see Exhibit 75).

Exhibit 75: Share of total page views on major search engines vs. query share, 2005

It was evident even in the mid-2000s that people associated Google with search. This helps explain why Yahoo! and MSN (Bing) have been unable to steal share. Visitors just simply don't associate them with online search.



Source: comScore, company data, Goldman Sachs Research estimates.

Rating and pricing information: Amazon.com Inc. (B/N, \$253.37), Apple Inc. (B/N, \$547.25), Facebook, Inc. (B/N, \$26.97), Google Inc. (N/N, \$691.13), Intel Corp. (S/A, \$20.16), Microsoft Corp. (N/N, \$26.73) and Samsung Electronics (B/A, W1,454,000).

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