

## Investment Research

Tablets finally come into their own  
It only took 40 years...

Gerard Hallaren, CFA 303-347-2884  
July 28, 2010

*It is better to know what a firm's customers are doing than what its management was saying*

### Investment Implications

Tablet computers are very likely the next very high volume consumer mobile electronic device. This market will demand more flat screens, more mobile processors, more flash memory, and more mobile graphics processors than it ever has in the past. As a result, we expect that many component companies and a few tablet manufacturers, like Apple, will prove to be outstanding investments.

Thus far, Apple offers the first mass market tablet. Before year-end, we expect Dell, HP, HTC, Research in Motion, Nokia, and a host of other companies to offer tablet devices.

### What is a tablet computer?

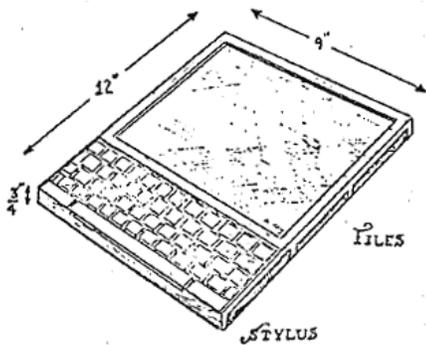
Tablet computers are and have been a holy grail among systems designers and makers since Alan Kay first sketched the idea in 1968.

We see Apple's iPad as the first successful mass market tablet computer. Contrary to popular thought, it is not a sudden invention but rather the outcome of many years of industry evolution. Alan Kay, then of Xerox and currently an Apple fellow, presented the idea of a tablet/notebook computer 1968 and called it the "Dynabook." It was one of the founding concepts of Xerox's famed Palo Alto research center.

*"In general, a tablet PC is a wireless personal computer (PC) that allows a user to take notes using natural handwriting with a stylus or digital pen on a touch screen. A tablet PC is similar in size and thickness to a yellow paper notepad and is intended to function as the user's primary personal computer as well as a note-taking device. Tablet PCs generally have two formats: a convertible model with an integrated keyboard and display that rotates 180 degrees and can be folded down over the keyboard or, a slate style, with a removable keyboard. The user's handwritten notes, which can be edited and revised, can also be indexed and searched or shared via e-mail or cell phone."*

-- PC Magazine circa 2001

*"A "tablet computer," or simply "tablet," is a complete computer contained entirely in a flat touch screen that uses a stylus, digital pen, or fingertip as an input device instead of a keyboard or mouse." – Wikipedia circa 2010*



Dynabook, circa 1968



Apple iPad, July 2010

## Why do people buy tablets?



Apple Newton



Panasonic Toughbook, circa 2008



Amazon Kindle FCS 11/2007

Tablets and smartphones provide consumers with an almost infinite ROI. They buy time and enable mobility. The vast and expanding applications universe through the iStore, Android market, or other applications sources provide specific triggers.

Generally, we believe customers buy tablets to fill in where other devices fall short. This has been the rationale for virtually every portable computer, smartphone or personal media player. Because of the ever-increasing application base, it is impossible to list every potential rational but in general,

Compared to notebook computers we see tablets adding:

- Increased mobility/portability
- Longer battery life
- Ability to run portable applications
- Improved wireless communications

Compared to personal media player justification plus:

- A better reading capability
- Games
- Larger video formats
- The ability to stream video and music
- A business-like appearance
- Email/SMS and other communications

This thought of “a device that fits in-between” causes us to expect the market to produce a wide range of devices beginning with smart phones and ranging to something slightly smaller than a laptop.

## Which companies benefit: AAPL, HTC, and ???

Among tablet manufacturers, we believe few will generate long-term returns substantially greater than the PC industry. In the nearer term, we expect that Apple will sustain its pricing power and thus continue to generate high returns from the tablet. As long as demand outstrips supply, tablet makers will generate high returns. While we are not completely sure about all of the manufacturers, we expect the market to produce Android, Blackberry, Windows, MeeGo, Symbian, and possibly even WebOS tablets in time for this year’s holiday season. In the near-term, we are most intrigued by HTC and its Android position.

## Tablet Components: QCOM, INTC, SNDK, ARMH, NVDA

Component suppliers are also likely beneficiaries of tablet demand. Each device will have:

- Screens
- Memory (DRAM, NAND and potentially an accessory HDD\_
- Batteries
- Processor(s)
- Graphics subsystems
- Communications capabilities
- Operating systems

Within each of these components, we see the greatest potential for:

- Screens: AMOLED, low energy consumption LCDs and electronic paper
- Energy saving processors like Intel's Atom, Qualcomm's Snapdragon and ARM based devices.
- Graphics subsystems for video, games, and potentially e paper.

We will cover each component vendor's position in more detail in our Tablet teleconference at 11:00 AM on July 30, 2010.

## Tablet Media and Entertainment

Because of their larger screens, Tablet devices are generally more attractive than handhelds for video entertainment and internet browsing. To us, this opens a broad discussion regarding personal media. Consumers will easily be able to stream internet video from YouTube to Netflix. We expect a plethora of applications will emerge to facilitate delivery of paid media. We expect the following internet oriented media companies to be among the largest media beneficiaries of tablets:

- Netflix
- Amazon
- Hulu
- ESPN
- Most major sports leagues

The other large media application we see is mobile television. Portable mobile television is a byproduct of the US's transition to digital television. In our opinion, delays in the ATSC-MH (Advanced Television Standard Committee – mobile and handheld) standard have limited roll out to very few cities. During the coming 24 months, we expect broader adoption of mobile television and that tablets will be ideal display devices.

The primary risk to the mobile television scenario is the FCC's desire to redeploy broadcast spectrum to mobile broadband carriers.



Convergent Technologies  
WorkSlate, circa 1984



Tandy TRS-80 100,  
circa 1983

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## All of our opinions are for a 12 to 18 month time horizon.

**BUY** ~ Company is well positioned in a high growth market or gaining share and no discernable threats to current fundamental momentum. Stock is expected to meaningfully outperform its peers and the market averages

**AVOID** ~ Conflicting fundamental cross currents make a compelling long or short recommendation unclear.

**SELL** ~ Company's markets are shrinking or it is losing share and/or we anticipate fundamental deterioration. Stock is expected to meaningfully underperform its peers and market averages.

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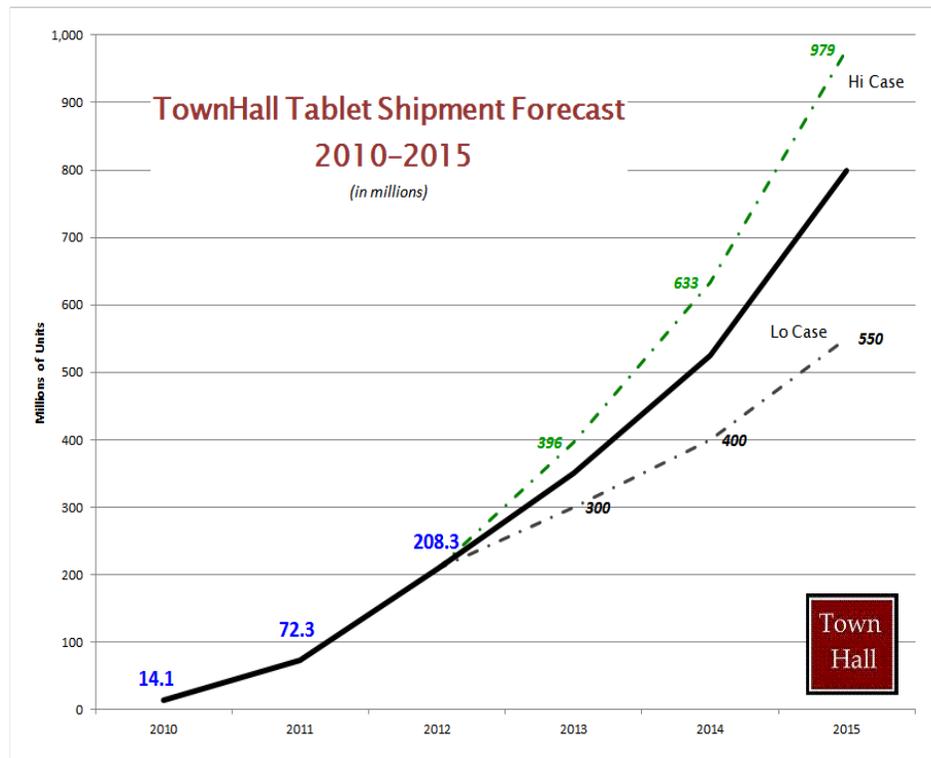
# The Bible on Tablets

TownHall Research Team and Network

Date: September 13, 2010

*It is better to know what a firm's customers are doing than what its management was saying*

## 3 Sectors to Boom, 1 Behemoth Tarnished



Winning Sectors		
<b>ARM Licensees</b>	<b>Mobile Broadband</b>	<b>Internet Media and Entertainment</b>
<i>ARM simply deliver more MIPS per watt than other popular architectures</i>	<i>To us tablets look like an accelerant to an already hot fire</i>	<i>Tablets are yet another portable low cost outlet for digital media.</i>
<i>Qualcomm, NVIDIA, Apple, Marvell</i>	<b>Clearwire</b>	<b>Netflix, Amazon</b>
Intel, the Tarnished Behemoth		
<p>Intel has not had the will to stay in the mobile processor business. Indeed, it sold its business to Marvell and now has bought Infineon's mobile processor business. We believe it will take time and a culture change for Intel to accept ATM cores on a large scale.</p>		

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# Investment Observations and Overview

We expect tablet computers will be a large, long-term, and very durable market. With this, we expect many investment opportunities and pratfalls. At the highest and most durable levels, we point investors toward:

- Semiconductor suppliers – **Qualcomm, Marvell, NVIDIA** and **other ARM licensees**
- Smartphone companies well positioned to succeed in tablets – **Apple, HTC** and **Motorola**
- 4G Carriers that embrace open and wholesale models - **Clearwire**
- Media companies like **Netflix, Amazon, YouTube** or **Hulu** which get a new and improved channel to sell through
- Transportable service companies like **Google, Skype**, and **Facebook**

While we do not have an opinion on Intel equity, we see the giant sitting out for at least the first inning of the tablet boom. Because it offers fewer MIPS per Watt, Intel's atom is not suitable for mainstream tablet applications.

**Ultimately, we expect tablets and similar devices to co-opt smartphones.** This very large market creates opportunities for tablet manufacturers, and their suppliers. In preparing this report, we used a number of experts from within our Network. This report ranges beyond the scope of our normal work. For those companies we do not cover, such as semiconductor suppliers, we offer our perceptions based on industry input regarding how those companies are hurt or helped.

For example, **today ARM architectural licensees are taking considerable processor share from Intel.** Unless Intel changes its stripes, we see this continuing for a long time. Intel is a very efficient manufacturer of relatively standard processors while the ARM licensees design processors for specific markets. We think Intel's Infineon acquisition will be an improvement but that it will take a relatively long time for the behemoth to change religion.

ARM based purpose built processors are one factor enabling tablets to evolve from the devices we know today – the iPad, Kindle, Sony's Dash, and an expected onslaught of devices from Motorola, HTC, Nokia, and dozens of others.

**We see Tablets as the beginning of a significant change in the personal device markets.** Personal devices range from personal media players (iPods) to smartphones to personal and game consoles to netbooks, laptops, PCs and network equipment (set-top boxes). This revolution will undoubtedly move in fits and starts, and possibly take more time than our forecast as it signals major industry changes.

## Investment Summary: Winners and Losers

Ultimately, we expect tablets and the devices tablets subsume to considerably outsell smartphones. This very large market creates opportunities for tablet manufacturers, and their suppliers. As mentioned earlier, in this report, we highlight several sectors and companies, many of which are far better covered by our experts and range beyond the scope of our normal work. For those companies we do not cover, we offer our perceptions based on industry input and presented in our recent *Tablet Teleconference* regarding how that company is hurt or helped:

Table 1: Companies benefitting from Tablets

<b>Company</b>	<b>TownHall Opinion and Comment</b>
<b>Smartphones</b>	
<b>Apple (BUY)</b>	With the iPad, Apple has once again established and set a high bar in a new and rapidly growing market. We believe Apple's expertise in the UI will give it an edge over every other general purpose tablet vendor. Hence, we expect it will maintain a dominant position.
<b>HTC (BUY)</b>	We see HTC with its <i>Sense</i> user interface as likely to be successful in Android and Windows based tablets.
<b>Motorola (BUY)</b>	Like HTC, Motorola's user interface gives it an edge over other Android makers. Moreover, Motorola's ability to integrate tablets with set-top boxes and mobile television give it an edge. We expect the company will offer competitive devices in the future and revisit our opinion in the future.
<b>Components</b>	
ARM Holdings	ARM's core licensing business benefits from wide deployment of tablets and other specialized devices. For example, Microsoft recently acquired an architectural license. We expect there will be more licensees, perhaps even Intel.
ARM Licensees	<b>Qualcomm, Samsung, Texas Instrument, Marvel, STM, MediaTek, NVIDIA, and Renesas</b> are all ARM architectural licensees. We believe these licensees have a large opportunity to build processors for coming generations of tablets.
<b>Universal Display (BUY)</b>	Expected to supply critical AMOLED materials/dyes to most major screen makers. A contributing factor to the proliferation of AMOLEDs into small devices.
Imagination Technology	This UK public company is following a model similar to ARM holdings but with graphics rather than central processors.
AMD	The company's yet to be delivered combined CPU/GPU holds promise for greater participation in the tablet and portable markets.
<b>Carriers</b>	
<b>Clearwire (BUY)</b>	Clearwire's mixed retail/wholesale model insures the company will thrive in new and old markets. Its ability to deliver higher speed services than competitors should enable it to be the best service provider to the tablet market, especially in 2010-11
<b>Media Companies</b>	
<b>Netflix (BUY)</b>	We expect Netflix to lead the charge in carrying media to tablets and similar computers. Indeed this company already has an iPad service. Look for Netflix to remain the first mover among new media service providers.
Amazon Hulu Broadcast TV	These comments apply to a wide variety of media and gaming companies. We see tablets as an important content outlet that likely will create new modes and opportunities.
Local News	We see tablets as being useful as mobile televisions and thus as one of the best hopes to end the FCC's campaign against local news and broadcast.

Figure 1: Markets that end



Table 2: Losers mired in the past

<i>Company</i>	<i>TownHall Opinion and Comment</i>
Intel	We expect there to be many different tablet devices ranging from handhelds, like the iPod Touch, to devices larger and more capable than the iPad. We believe this differentiation calls for many different processors. Hence, we believe that ARM’s licensees ability to tailor processors for the application and develop superior solutions to Intel’s mass-market approach. Moreover, we see Intel’s netbook and notebook processor business becoming cannibalized by ARM processors designed for specific tablets.
<b>Research In Motion (Avoid)</b>	Sadly this formerly innovative smartphone pioneer seems more focused on that which made it successful, rather than on that which will make it successful.
<b>AT&amp;T (Avoid)</b> <b>Sprint (Avoid)</b> <b>Verizon (BUY)</b>	Capped data plans make no sense in a world of personal Wi-Fi networks and tablets. We expect that major carrier’s growth will be constrained until these companies discard strategies designed around fee based services rather than efficient service delivery.
Set Top Boxes	We think tablets can become the first “substitute good” for set-top boxes. Motorola is already hinting at making this available on an early tablet.
Pay Television	With ubiquitous internet video and the potential for local mobile television, we think Pay TV faces many challenges. At least the cablecos have wired broadband businesses and are experimenting with wireless. For now, the Satellite TV companies are bound by technology limitations and seem unable to make needed transitions.
Personal Media Players	Smartphones have diminished demand for these devices. We expect both generic and specialized entertainment tablets will further accelerate this market’s decline.
Netbooks/Laptops	With smaller forma factors, we expect that tablets will be purchased instead of many laptops and the majority of netbooks. Look for declines in these markets to become apparent by 2012.
Specialized Mobile Data Terminals	Motorola’s Symbol Technologies which makes mobile barcode and RFID scanners along with systems that control, manage these devices, is probably the best known specialized terminal manufacturer. Other applications include factory floor, taxicabs, police cars, and built to order ruggedized devices. We would expect that the core computational engines in these devices will be replaced by tablets.

Table 3: Companies and markets with a lot to prove

<i>Company</i>	<i>TownHall Opinion and Comment</i>
<b>Nokia (Avoid)</b>	Nokia's smartphone and mobile operating system expertise are both relevant skill sets needed to compete. We expect the company will offer competitive devices in the future and revisit our opinion in the future.
Microsoft	The pre-release scuttlebutt on Windows Mobile 7 is more constructive than we expected especially when it is compared to RIM's Blackberry 6 operating system and tools. But is this a comparison of the vision impaired and the Blind? Alternatively, did Microsoft get it right? We do not yet know how Microsoft will behave with respect to licensing and support. For us, the proof of the pudding will be in the eating.
Sony	Sony has seen the tablet opportunity for many years. The Mylo and Dash are two attempts it has made to "create" the market. Its most recent attempt, the Dash requires proprietary software and does not appear to have yet generated a large developer base. If Sony can break away from its NIH culture it could become successful.
Smartphones	We see little to interrupt the smartphone market in the next two years. As 4G services become more widely available, tablets reduce the need for these popular devices. We would not be surprised if consumers shifted many smartphone applications to tablets and used the handset as a voice appliance or portable PDA only.

## How tablets drive internet media and entertainment

We expect that Internet entertainment and media companies will see dramatic expansion in demand as a result of tablets. One of our seminal trends has been "Stream it don't save it." In turn this spawned our Netflix recommendation. With very little doubt we see Netflix as a big tablet beneficiary. It however, is not the only entertainment winner. Amazon, mobile television, Hulu and, should the cable companies execute their content aggregation strategy, even the cable companies can benefit from streaming entertainment to tablets. Apple's iTunes is another beneficiary but for our money we prefer the companies above for video and legalsounds.com for music.

## What Tablets mean to Carriers

Demand for mobile broadband continues to grow at unprecedented rates. We see tablets, with their mobility and processing power as being an accelerant to mobile demand. As best we can tell, **Clearwire is the only carrier capable of delivering mobile broadband to bandwidth hungry tablet owners.** Most of the mainstream carriers, AT&T, Sprint, T-Mobile provide high priced mobile broadband service, mandatory smartphone data plans and monthly upcharges on the better smartphones. All of these are deterrents to connecting tablets to mainstream carrier networks.

While tablets are voracious consumers of bandwidth, the mainstream carriers, AT&T, Sprint, T-Mobile and Verizon only begrudgingly sell mobile broadband -- \$60 for the first 5GB and then \$50 for each additional GB, unless you are on T-Mobile which throttles your speed once you go over 5 GB. We believe this high priced strategy drives tablet and other consumers to Wi-Fi.

In the US, we see Clearwire as the only carrier offering true unlimited mobile broadband. We see it as the one carrier truly helped by growing tablet sales. Looking into overseas Market

**Table 4: Carrier Data Plan Analysis**

	<b>AT&amp;T</b>	<b>Sprint</b>	<b>T-Mobile</b>	<b>Verizon</b>	<b>Clearwire</b>	
<b>Monthly Price</b>	\$60	\$59.99	\$39.99	\$59	\$25	\$55
<b>3G Service</b>	5GB	5 GB	5 GB	5 GB	NA	5GB
<b>Overage per GB</b>	\$50	\$50	Lower Speed	\$50	NA	\$50
<b>4G Service</b>	NA	Unlimited	NA	NA	Unlimited	Unlimited
<b>Overage per GB</b>	\$50	NA	Lower Speed	\$50	NA	
<b>Comment</b>	No 4G any time soon	4G modems switch back to 3G service on any interruption and require a restart to get back to 4G.	No 4G any time soon	LTE Coming with broad coverage but limited capacity.	Limited Coverage with considerable capacity. Expect coverage to expand rapidly to major cities.	

*Source: TownHall Investment Research*

**Table 5: Real World Performance 3G vs 4G**

<b>Real World Performance (Kbps)</b>	<b>3G</b>	<b>4G</b>
<b>Download</b>	1,500	4,500 +
<b>Upload</b>	800	1,500

*Source: Novarum – 3G, TownHall 4G*

## What is a Tablet Computer?

*"In general, a tablet PC is a wireless personal computer (PC) that allows a user to take notes using natural handwriting with a stylus or digital pen on a touch screen. A tablet PC is similar in size and thickness to a yellow paper notepad and is intended to function as the user's primary personal computer as well as a note-taking device. Tablet PCs generally have two formats, a convertible model with an integrated keyboard and display that rotates 180 degrees and can be folded down over the keyboard -- or a slate style, with a removable keyboard. The user's handwritten notes, which can be edited and revised, can also be indexed and searched or shared via e-mail or cell phone."* - PC Magazine circa 2001

*"A "tablet computer," or simply "tablet," is a complete computer contained entirely in a flat touch screen that uses a stylus, digital pen, or fingertip as an input device instead of a keyboard or mouse."* – Wikipedia circa 2010

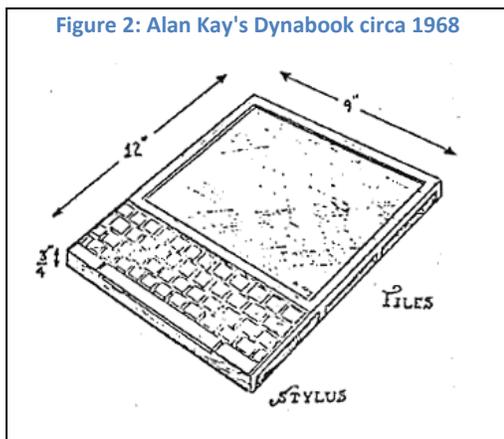
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Many thought the laptop would be the Dynabook. However, emphasis on Desktop replacement and performance at the expense of portability limited laptops and successors (note and netbooks) to a business environment.

The difference between today and when the ideas of tablets were first being kicked is that there are hundreds of commodity devices in the market and the carriers - the wireless carriers, are generally

managed by wired network types and they have priorities: to cut costs, make it cheaper, and make it look pretty. If we left technology development to the carriers it is likely we'd all be using free Motorola Razors.

Apple is a major factor in the smartphone and tablet market. Its presence had made both markets bloom. Apple said no to the carriers and laid the groundwork for new devices. And, we all know the *iSeries*, the iPods, the Phones and the Pads all broke new ground and got right what other innovators got wrong.



## Market Forecast: to infinity and beyond

**We believe the tablet market is poised to outstrip nearly every expectation we have seen.** And that high tablet growth will translate into a boom for ARM Licensees like Qualcomm, NVIDIA, Marvell and hurt Intel.

Our optimism stems from myriad applications, innovations, and markets where tablets can improve customer ROI over existing technology. While smartphones sell primarily into upscale markets, we expect tablets will sell to a much larger market. Currently tablets sell at prices from \$99 for a barebones 7" android Wi-Fi tablet to more than \$800 for a top of the line iPad with 3G capabilities. Not surprisingly we expect the low end market will account for substantially more unit volume than the high end.

### Why we use an expanding market definition

One critical element of our forecast is its expanding market definition. From the present through 2012, our forecast considers tablets largely as an incremental new market. We believe this part of the forecast will be particularly helpful to component analysts and investor. **Beyond 2012, we see the tablet market usurping devices using similar components so that this forecast will be helpful but less relevant for component forecasting. However, we think it highly relevant forecasting mobile broadband demand.**

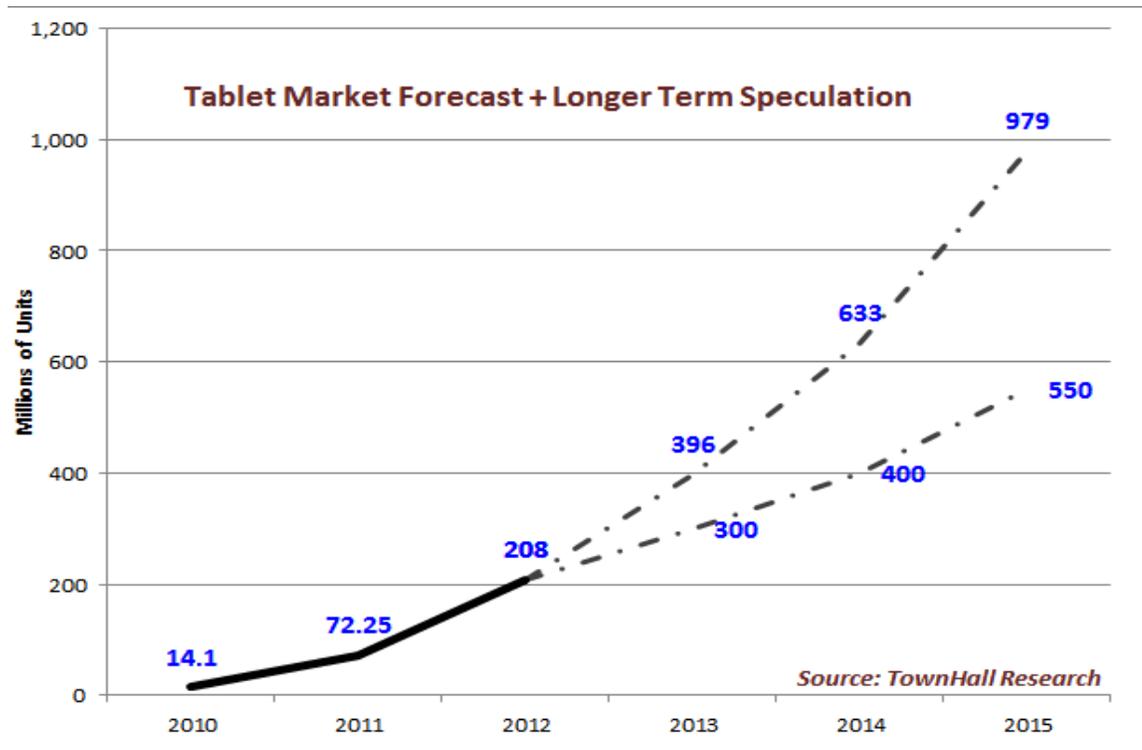
Inherent in this forecast is our expectation for a continuum of mobile devices. The low end of this continuum begins with small wearable or "pocketable" devices for network access, secure identity, near field communications, and personal area network management. Laptop computers define the market's upper bound. We expect tablets will compete in most of the markets between personal communications devices at the low end and laptops at the high end.

### Why aren't Superphones and the iPod Touch Tablets today?

For the purposes of market definition and our forecast, we defer counting superphones and the iPod Touch until 2012 in our market forecast. This is somewhat arbitrary on our part as both superphones and the Touch embody most tablet features in a very small package. Indeed, experimenting with an iPad Touch told us that there would be many more options with 4G than with 3G. However, we do not yet see consumers making either or decisions between tablets and touches.

Recall that the iPod touch debuted as a better personal media player. Today Apple is positioning it as a gaming platform. These are too narrow to be tablets. Similarly superphones are sold as enhanced voice devices even though they have many tablet-like capabilities. We believe a measurable segment of consumers will choose between handhelds and a tablet in 2012, hence that is when we begin to consider iPod Touch and similar devices in our "Tablet" forecast.

Figure 3: Tablet forecast and speculations



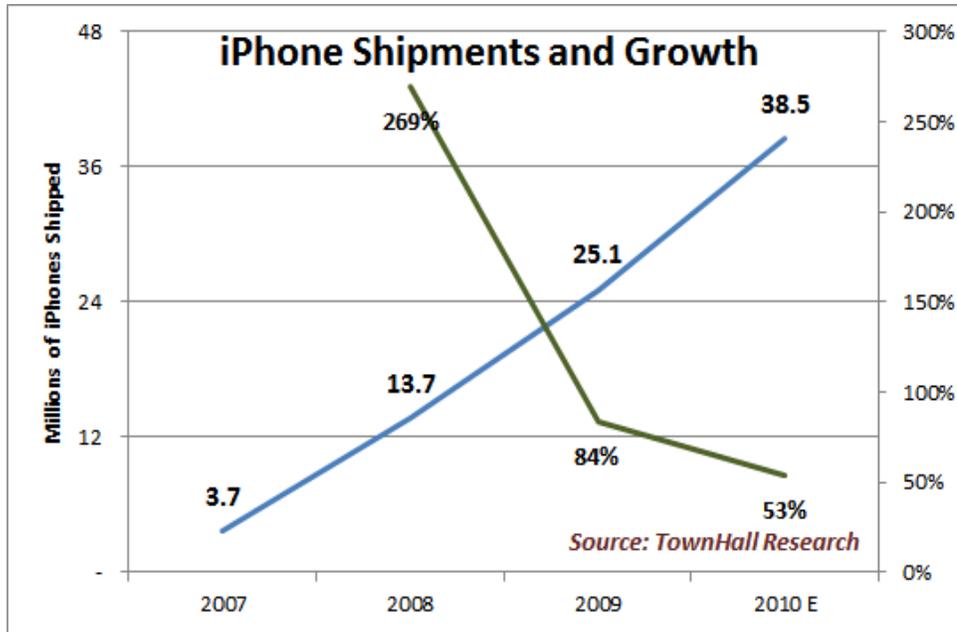
Tablet markets are not tied by the same constraints of phone and personal computer markets. The devices cost less than alternatives – laptops and netbooks, have wide open distribution channels (even Kmart sells one) and do not have to suffer the indignity of carrier testing nor the fumbling of carrier marketing.

### iPhone as a precursor

At launch, the iPhone was a radical device entering a somewhat well prepared market. Apple fans instantly embraced it but it took time for the mass market to appreciate it. AT&T, the exclusive iPhone carrier, had/has a weak network. At least this gave Apple time to build worldwide distribution. Yet the iPhone market is limited by carriers. We believe Apple could increase its US iPhone sales by 50% to 100% if Verizon, Sprint and T-Mobile all offered the iPhone at competitive prices. While carriers will be an important channel for tablets, we expect the internet and conventional retailers will ultimately sell more units than the carriers.

By comparison, tablets are priced at or below most competitive devices. They offer greater mobility and are useful for more applications and in more places. **We see the tablet market as if several iPhone markets kicked off simultaneously and were followed by additional models and form factors each reaching different segments.**

Figure 4: iPhone shipments and growth forecast



## Major Drivers – Available market and innovation

Forecasting unit volumes in completely new markets means making assumptions and estimates how markets can develop. While we think that between  $\frac{1}{3}$  and  $\frac{1}{2}$  of the tablet purchasers will not be replacing another device, many will. Some of the markets we see up for replacement are:

- 1.3 B Handsets per year
- 300 MM Smartphones anticipated for 2010
- 350 MM Personal Computers per year
- 110 MM digital cameras per year
- 200 MM Flat screen televisions anticipated for 2010
- 120 MM Television set top boxes per year
- 230 MM MP3 players anticipated for 2010

The point here is that the replacement/augmentation market for tablets is very large. Note that almost none of these, perhaps with the exception of MP3 players, appeal to the low price buyer who will consider a tablet as the family's internet device. **The Calculator's market development may be a better model than some of the devices listed above.**

Later in this report we examine applications as a deciding factor between various tablets. More important though are innovations we expect during our forecast period. These we see driving overall demand making tablets as a group more appealing. Some of the major technology and marketing innovations we expect are:

- AMOLED displays
- Longer Battery Life

- Alternative Power
- OLPC becomes OTPC
- Closer graphics/CPU Integration
- Enterprise Class Security and Integration
- Faster networks and less expensive networks in the form of unlimited and open 4G service
- Resolution of Personal Area Networking (PAN) technology
- Security and identity protection advancement in Near Field Communications (NFC)

The point here is we that in addition to spurring new purchases, there are many reasons for customers to upgrade and purchase **multiple tablets and hand held devices**. Each of these innovations deserves considerably more treatment than a bullet list in a report on tablets. Should you wish to learn more about any of these, we would be happy to provide clients with access to specialists in each area.

## Translating innovation to markets

Our forecast method endeavors to tie the innovation to markets. The primary translation effort is to tie our best estimates of consumer adoption, supplier/manufacturing capabilities, and channel availability. One of the reasons we expect such high growth is that we believe that carrier network speeds are increasing whether with 4G or 3.5G technologies like HSPA+.

Analyzing the list above, our expectations are as follows:

- AMOLED's become more widely available beginning in 2012 and their wider availability will be a reason to upgrade existing devices.
- Longer battery life will likely be a steady trend creating growth and upgrades.
- We believe alternative power (primarily solar) will begin to impact the market in 2012 and will continue to expand the market beyond then.
- One Laptop Per Child (OLPC) has been a world political issue, unfortunately the economics have not been good enough to meet the organizations aggressive goal. Tablet economics are better and we expect OLPC will use tablets to meet its goals.
- Closer graphics/cpu integration means less power consumption which is a plus. The larger impact will likely be on tablets for gaming.
- We expect enterprise security and integration to improve at a moderate rate expanding the total available market during the forecast and speculation periods.
- Less expensive and faster networks makes tablets more attractive for media and entertainment and pushes tablets into the home hub market.
- Right now WiFi is the predominant personal area networking technology. Unfortunately WiFi consumes considerable power and lacks important security. We believe it will take a new standard in 2013 to 2014 to expand the tablet market to our high case.
- Everyone leaves their house with keys, wallet and cell phone. Imagine if you did not have to carry a wallet or keys because your cellphone fulfilled wallet and key tasks. This is what we see as the biggest contribution from near field communications (NFC) and is another factor that pushes to the higher end of our forecast.

**We see consumers as more prepared to buy tablets than they were for iPhones.** While there were smartphones before the iPhone, the iPhone was such a radical departure from any prior device. Tablets have had many precursors like the iPhone, iPod Touch, Netbooks and eReaders. Today's consumers

have greater confidence and experience with Android and Apple technology. **Hence, we believe consumers will adopt tablets more quickly than the iPhone.**

The first time we attempted to forecast the tablet market, we built our forecast around Apple’s iPad, Android based devices and other knockoffs similar to the iPad and then an arbitrary estimate of “as yet unknown” devices. As we tested this thesis we found it lacking in discipline and granularity.

Hence, our next effort involved more granular analysis. Again, we used the Apple vs. the world technique. However, this time, as you can see in table 5 we built the forecast from the bottom up by form factor. The odd thing was that even though we changed our method, the both analyses led to similarly sized markets.

## Tablet market forecast by form factor

Figure 5: Tablet market by form factor

<u>Millions of Tablets</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
<b>Total</b>	<b>14.1</b>	<b>72.0</b>	<b>208.3</b>
Slates		5.0	18.4
9" and 10" Tablets	12.5	38.5	90.2
7" Tablets	1.5	25.1	73.5
Handhelds	0.1	3.0	18.7
Phone Tablets			6.5
Specialty		0.5	1.0
<u>Growth Rate</u>		<u>2011</u>	<u>2012</u>
<b>Total</b>		<b>411%</b>	<b>189%</b>
Slates			267%
9" and 10" Tablets		208%	135%
7" Tablets		1570%	193%
Handhelds		2900%	523%
Phone Tablets			NM
Specialty			100%

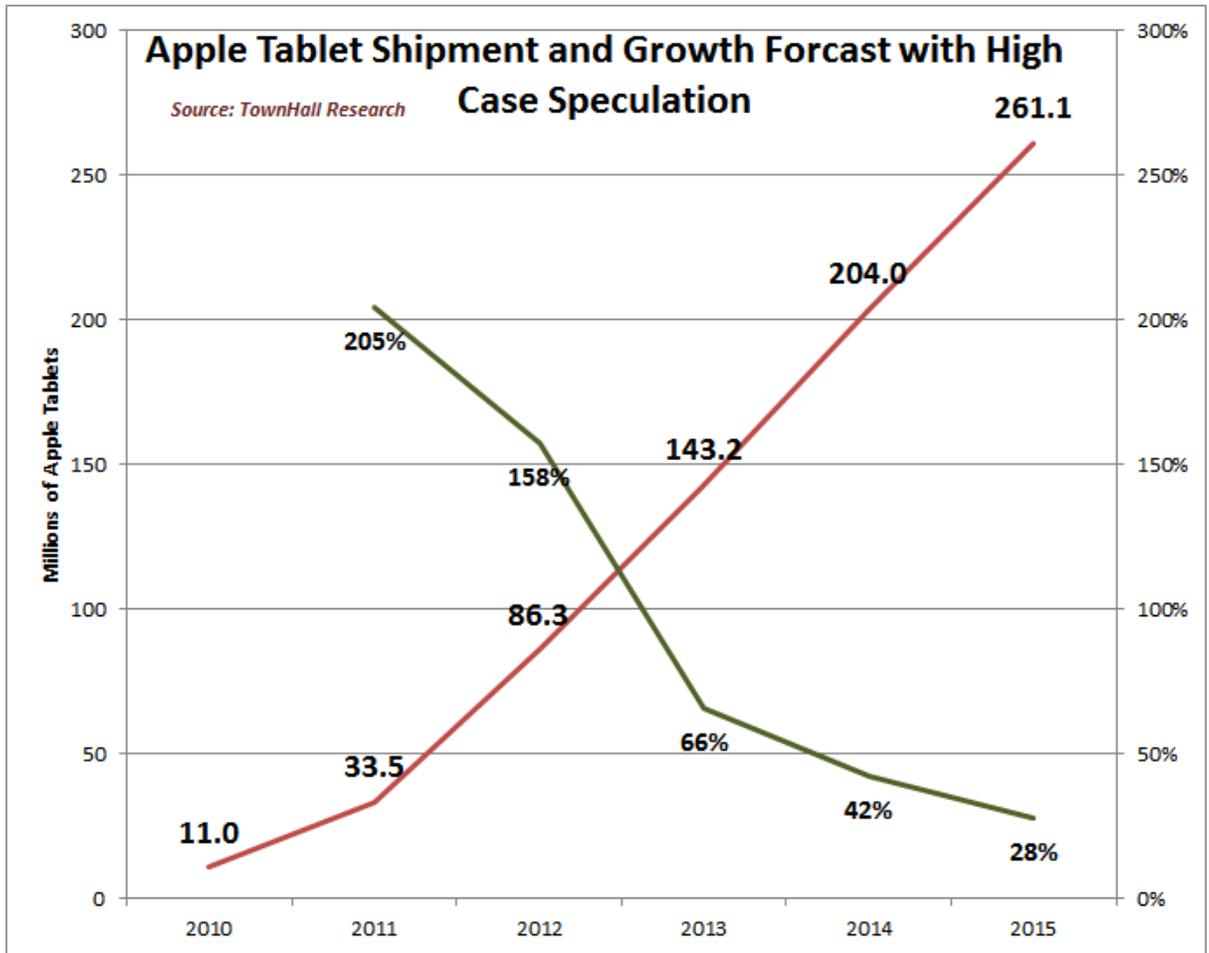
**Source: TownHall Investment Research**

In these beginning years, we expect the most visible market translation of innovation to market growth will be in form factor growth. For example, the clarity and brightness of an AMOLED display allows end users to use smaller more convenient screen sizes. This influences our projection in the form of higher growth rates for 5” and 7” screen size tablets compared to 9” tablets. Indeed, this is more easily seen in the details of the various out year forecasts.

## Sidebar: Apple vs. the world - growth and share projections

We know that few clients would allow us to analyze the tablet market without at least trying to project Apple's role in the nascent market. The following graphic depicts our expectations for Apple's tablet shipments and growth using our "high case" speculation. Naturally we caution investors that this is a market less than 6 months old and that we expect Apple to continue its technology leadership and announce products. We are happy to provide details behind these forecasts should any client like to point and laugh the assumptions and details.

Figure 6: "High Case" projection for Apple's Tablet business



Source: TownHall Investment Research

## Tablets in or about to launch in today's market

We compiled this table to demonstrate ARM's dominance and to identify significant competitors. Tablets are a very dynamic business and this table is far from exhaustive. For example, we found many Far East based distributors selling a 7" tablet for \$99 or less. Unfortunately, we could not discern the manufacturer. Appendix A provides commentary on most of the vendors and products.

Table 6: Current and imminent Tablets

Vendor	Avail.	Product Name	Price	OS	Processor	Screen Size in Inches
<b>Apple</b>	<b>Now</b>	<b>iPad</b>	<b>\$500 to \$800</b>	<b>iOS</b>	<b>ARM Apple</b>	<b>9.7</b>
Acer	Q4-2010	NA	NA	Windows 7	Intel	7
Acer	Q1-2011	NA	NA	Android 3	ARM	7
Archos	Now	5	\$300-\$500	Android	ARM Cortex A-8 + DSP	4.8
Archos	Now	7-Home	\$199	Android	ARM Rockchip 2808	7
Archos	Now	9-pctablet	\$429	Windows 7	Intel Atom	8.9
Asus	Mar-11	NA	NA	Windows 7	Intel Core2 Duo	
Augen	Kmart now	Gentouch 78	\$150	Android	ARM Telechips 8902	7
Dell	Aug-10	Streak	\$549	Android	ARM -- Qualcomm	5
E-Noa	Soon	Interpad	\$510	Android		10
HP	Q1-2011	PalmPad	NA	WebOS	Texas Instrument OMAP	9
HP	g-Pad	Slate 500	NA	Windows 7	Intel Atom	9
HTC	Black Friday	NA	NA	Chrome	ARM-nVidia Tegra 2	>7
Lenovo	Q4 2010	Skylight	NA	Android	ARM -- Qualcomm	10" hybrid
Lenovo	Q4 2010	Skylight	NA	Android	ARM -- Qualcomm	10"
LG	Q3 2010	Optimus	NA	Android	ARM -- Nvidia Tegra 2	10
Nokia	Q4 2010	NA	NA	Meego	ARM	7
Nokia	Q4 2010	NA	NA	Meego	ARM	9
Notion Ink	Nov-10	Adam	\$330	Android	ARM -- Nvidia Tegra 2	10.1
Open Peak	Soon	OpenTablet 7	NA	Linux	Atom	7
Open Peak	Now	OpenFrame 7	NA	Linux	Atom	7
Open Peak	Now	ProFrame7	NA	Linux	Atom	7
OpenPeak	Now	OpenFrame 7E	NA	Linux	Atom	7
RIM	10-Nov	BlackPad	NA	QNX	ARM -- Marvell	9.7
Samsung	Sep-10	Galaxy Tab	<\$300	Android	ARM --likely in-house	7
Toshiba	Sep-10	Folio 100	\$510	Android	ARM -- Nvidia Tegra 2	10
Verizon	Q4 2010	Zpad	\$199	Android	ARM -- Nvidia Tegra 2	10.1
ViewSonic	Q4 2010	ViewPad 7	NA	Android	Intel Atom	7
ViewSonic	q4 2010	ViewPad 10	\$850	Windows 7	Intel Atom	10
Olive	Now	Olive Pad	50% below iPad	Android	ARM -- Qualcomm	7
<b>Source: TownHall Research</b>						



## Devices that fit “In Between”

Figure 8: Tablets fit in between

### Tablets fill in between

- All the note/net book arguments plus
  - Increased mobility/portability
  - Longer battery life
  - Easily in touch with work
- All the Personal Media Player arguments plus
  - Easier to read
  - Access the Net
  - Video Entertainment
  - *Appears businesslike*
- All the Smartphone arguments plus
  - Better screen
  - Easier web browsing



We see tablets as a “device that “fits in between.” This causes us to expect the market to produce a wide range of devices beginning with hand held devices like the iPod Touch and ranging to something slightly smaller than a laptop. This notion of fitting in between is also the rationale for PDAs, Portable Computers, Laptops, Notebooks, and Netbooks.

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## How consumers choose tablets – or why Apple can continue to win

We expect consumers will choose tablets for common sense consumer reasons. Except for price, Apple shines in nearly all of these criteria.

- **Brand** - Apple is certainly better known to consumers than Motorola, Samsung, HTC, or Lenovo.
- **Ease of Use** – Apple’s UI continues to be superior to MotoBlur or HTC Sense, which we believe are the best android interfaces.
- **Vendor Support** – Choose between making an appointment at Apple’s in store “genius bar,” calling Verizon or Sprint, visiting Radio Shack or calling Best Buy’s Geek Squad.
- **Applications Availability** – Apple App Store has more applications and better integration than Android Market or Windows Marketplace.
- **Market Support** – Apple products have many accessories, myriad iPhone users provide informal support. Apple stores offer the genius bar as a place to bring devices for help or repair.
- **Hardware** – Is the package attractive, sturdy, does it offer connections for television, additional storage, generic charging. Apple’s package is a attractive and sturdy but it does fall down on interconnection.
- **Integration:** Apple offers iTunes for books, music, television, and movies, iTunesU, the App Store, MobileMe along with the same synch utilities as are available on Android and Windows.
- **Availability/Channel** – Apple has all the bases covered while each of the others is either tied to a specific channel (carrier’s stores) or has to break in to the mass merchants.
- **Price** - We expect Apple will continue to charge premium prices

## Why Business Will Buy Tablets

Figure 9: Why enterprises will buy tablets



Like most enterprise technology goods, ROI will drive tablet purchases. RIM's Blackberry OS is well ensconced in enterprises so it should benefit from presence. However, work already done to integrate iPhones and Android phones will apply to integrating tablets. This should also be an advantage for Windows Mobile. However Windows Mobile 7 (WinMo7) is an all new architecture which makes us leery of predicting technical success. However if WinMo7 can seamlessly "drop in" to Microsoft's enterprise infrastructure it would be a major positive for Microsoft.

### Sidebar: Microsoft's Quandary

From watching and listening to Steve Ballmer interviews we think Microsoft should be very glad they hired Ray Ozzie to be its Chief Software Architect. We believe he, Ozzie, understands "the cloud," mobility, and the relationship between the two. This understanding is likely to translate into good consumer acceptance of WinMo7 and create a valuable technology product for the enterprise market.

This however does not guarantee success in the enterprise. Even though it is losing share, RIM still rules the enterprise roost with smartphones and Blackberry Enterprise Server (BES). With WinMo7 Microsoft comes toe to toe with RIM, Apple and Android. *Our reflexive prediction is that WinMo7 will be close but not right on the mark with current Microsoft enterprise offerings. Over time as Azure (Microsoft's Cloud OS) plays a bigger role and WinMo7 improves, we expect Microsoft will again become a factor in enterprise mobility.* Once WinMo7 ships later this year, we will be better able to forecast and characterize its enterprise impact. Though we must say, comments from carrier developers are constructive.

Our view begs the question should or would Microsoft buy RIM. In the past, we've believed the companies to be too far apart in business model and strategy. However, Microsoft surprised us when recently it took an ARM architectural license. That is usually a multibillion-dollar commitment. To us this lends some additional credence to the possibility.

The strategic question remains: how far could Microsoft take BES into its own accounts and supporting WinMo7 devices.

Figure 10: OpenPeak ProFrame 7



There are also people who by PCs that don't need them. For example, every receptionist could certainly use a tablet system like the OpenPeak Proframe 7 in figure 6 below. There are many people on the road; with salesforce.com there's no reason they couldn't use a tablet and probably would like using a tablet to connect with their system.

Finally, we think we'll see tablets constructed and configured for specific vertical device applications. This covers a wide range of territory and needs for

example, medical, specialists on the Stock Exchange floor, construction, warehouse, assembly, and test and logistics all use dedicated devices to do specific jobs. While there are some generic devices that fill these needs, generic tablets are likely to take considerable share.

## Future Tablets: Apps ultimately in the cloud

We expect tablet markets to evolve very differently from traditional technology markets. Technology's big trend since the late 1960s has been to move processing power towards the end users. Today's tablets and handhelds reflect this trend. People also want things to work both on and off line which is why more applications are not in the cloud. As internet access methods increase and become more available, we expect tablets will depend more heavily on the cloud for applications.

### Devices converge

We expect the current **eReader-handheld-smartphone-tablet-netbook markets to converge**. Today's devices are defined by their primary functions, reading, entertainment, mobile phone and internet browsing.



As the "device in the middle," tablets blur these definitions. We

expect 4G coverage and capacity will be widely available circa 2015, and that 4G will make personal communications very different from today.



Figure 11: HP's wristwatch hub

Figure 12: Derek Zoolander with Handset

Between now and then, most mobile handsets will become smartphones able to add applications. Looking forward, we expect personal communications may no longer revolve around a multifunction device as it does today. By 2015, we expect many people will use a device – be it a router handset, portable hub, tablet, or even a secure identity device – to connect to networks and distribute connectivity. The central device will handle a user’s connectivity requirements.

In 2009, HP showed a wireless hub in a wristwatch. Comsys, now part of Intel, offered a tiny handset cum 4G hub reference design called the “Zoolander.”

Figure 13: Hub model of personal communications



In this model, cellular handsets for heavy voice consumers may disappear as integrated Blue-tooth-VOIP headsets make calls. Others may prefer a more traditional cell phone and a third may carry a VOIP handset, which can access many networks. Some of those that carry a traditional cell phone are likely to use smartphones. However, many are likely to use a tablet or handheld (think Dell’s Streak or Apple’s iPod Touch) to run applications.

We include a television set top box in the above picture as there is a reasonable likelihood that the communications device will be able to control fixed or mobile televisions.

## Commodity Warning: Tablets for the cloud

Figure 14: Cloud owns future applications



As 4G becomes more available, investors should expect more applications and content to reside “in the cloud.” As tablets need to process less we expect they will turn into commodities as the UI is the browser, probably not from a tablet manufacturer and the applications do not depend on a device or operating system.

Google in particular is driving in us all the idea that everything is going to live in the cloud. We will not need to download anything or own any data. And clearly that lends itself to a certain type of very slim device as shown in figure 14.

Today there are genuine user experiences developing in and around the cloud and all of us use it to an extent. It is becoming friendlier and nicer than it was even a year ago to do everything by your browser.

To be realistic, there are **remarkably few places in the world where one is guaranteed a mobile broadband connection**. And, until you get to the point where mobile broadband is commonly available, consumers are not going to trust their most precious content or business files to the cloud if they think that even for 2% of the time you may not be able to access them.

**Google's cloud vision is decades away, if it is the only way.** Over time we expect Google will influence consumers. There are places where the cloud is appropriate, where you can get connectivity all the

Figure 15: Current vs. cloud Tablets

**Operating System**

- Device OS is today's technology
  - Apple
  - Android
  - Blackberry
  - WinMO
  - Symbian ^3
- Cloud OS is tomorrow's
  - Chrome
  - Mee
  - Web OS
- Hybrid "bridge" devices

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8/3/2010

time, some metro areas in the Far East are getting to that quality coverage. Also, we would not expect consumers to be too bothered by occasional interruptions in streaming radio

**In the meantime, we are at the very, very early stages of the tablet market.** Companies continue to have many ways to differentiate themselves beyond just giving an elegant slim device with a browser on it, which is not going to make them a great deal of margin once we get beyond this early iPad stage.

When coverage is assured, the experience becomes friendly and nice

where it used to be horrible. And these very cheap tablets with touch screens that one can throw in one's handbag make sense. The cloud experience becomes very usable and very compelling. This is as opposed to today's cloud experience on a PC or a phone, which remains really quite challenging.

Google issues considerable propaganda describing how great the cloud is. But actually, in real life, most of our use is a mixture of local storage and downloads versus cloud. In a rural area or an emerging economy, the balance shifts because broadband connectivity is less available. It's likely applications will have to become hybrids and they have to create an experience for both types of use.

A lot of the differentiation will come from how tablet manufacturers implement this. This is one area where Apple has an edge. After all, iTunes is a hybrid application; entertainment and education is downloaded from the cloud and played locally.

We think there's still room for companies, particularly at the high end to innovate and to provide different balances that suits different people's requirements. This however, is unlikely much below the top tier.

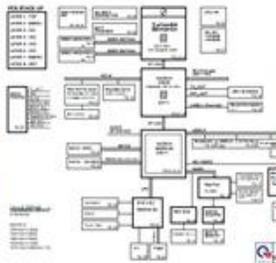
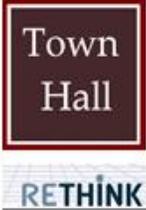
But when there are complicated experiences and different behaviors, then there's still room for companies particularly at the high end of this market to innovate and to provide different balances that suits different people's requirements whether they may need a business use a media use or a currently unconceivable application. Where we are now is that tablet makers are trying to work out how they can differentiate themselves beyond just giving an elegant slim device with a browser on it, which is not going to make them a great deal of margin once we get beyond this early iPad stage.

# How tablets will drive component demand

Figure 16: What's inside a tablet

## What's in a Tablet

- Screen
- Memory (DRAM, Flash, accessory HDD)
- Processor
  - Applications
  - Graphics
  - Communications
- Operating System
- Applications



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As devices multiply, converge and communication paradigms shift, we expect component demand to explode. Devices from handhelds like an iPod Touch to a large tablet like Samsung's Galaxy Tab all use similar sets of components. Today these components include integrated graphics and system processors, flash memory, Wi-Fi and other wireless data connections, Bluetooth, cameras, and high resolution screens.

In the future we expect to see additional provisions for secure near field communications, identity proof and protection (think of a personal SIM card), radio controlled, protected car, house and office keys.

## Processors: power and integration

This section is based on work by *Rethink Research's* Peter White

Figure 17: What GPU makers want

## Graphics: The never ending search for square feet

- Last Generation
  - Baseband versus Application processor, shift to SoC Phone
- Next Generation
  - Better graphics integration, Better parallelism
  - Open CL brings power to App Developers
  - 3D Video, instantaneous graphics
- Apple
  - Speaking up for APP developers with chip designers
  - Apple expected to be 2<sup>nd</sup> biggest chip buyer in the world
  - Leading the chip agenda for tablets, not as the design leader



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### Summary

Because tablets are small battery powered devices, power consumption and component integration are two major themes. Systems on a chip are likely to evolve to include both conventional and graphics processors.

Apple is leading the way in processors by controlling the agenda for processor makers. When we look at the last processor war, we saw Qualcomm and Texas Instruments arguing over putting baseband and application processors on one chip. Qualcomm went with one and Texas chose to do it separately.

And then all of the mobile chip suppliers moved slowly and surely toward a system on a chip, or phone on chip. During this evolution, Qualcomm took control of cellular chip market from Texas. Texas is certainly not out, but Qualcomm is in the driver's seat.

Now Apple has voted. The first chip change it made a few years ago was to move away from IBM chips for its Macs towards Intel. The second is that on every small device and the iPad it has used ARM. This is significant as Apple has become the second largest chip buyer and within a relatively short period of time we expect it will become the largest.

Apple's decision was the first round of Intel versus ARM. This is a market that you would naturally, two or three years ago, have expected Intel to dominate and it has not. We see Intel's purchase of Infineon's wireless unit as a late coming move to get back into the mobile business.

The next battle we see will be around graphic integration. Here we would point toward a small company and stock, Imagination. It's another British company copying the ARM way of doing things. It offers core licenses. But it seems to have crept onto all of those silicon vendors equipment. You know, Intel and Apple both hold licenses and own shares. But, so do Samsung and so do Texas Instruments and so do many of the others.

This triggers a discussion about the future of NVIDIA and ATI, and whether delivering silicon or licenses is the right approach. **We believe the licensing model is superior.**

Putting the pieces of the chip closer together saves power. So, process generation and higher levels of SOC integration are significant improvements. After that, engineers ask what else?

One of the things Apple has been pushing very hard is OpenCL, a computer language, which allows developers access to the graphics processor in a simple language like C and C++. And with more graphics processors on the chip, it allows them to behave as if they're CPUs as well. So they can share work with the ARM cores.

Apple is pushing this architectural development hard because graphics are its edge. It is also speaking up for its application developers by driving the chip development agenda by reminding suppliers that it is a very large buyer and I would like you to follow this plan. We want more GPUs onto the devices, and we are going to let our application developers do this so they can do some crazy things with tablets and then we can buy even more chips from you.

## Displays/Screens

TownHall analyst Jamie Townsend provided this section

Displays are a very important part of tablets and all devices wherever viewing images are critical. The technology behind the display affects not only the quality of the image but also power consumption, which is critical for mobility. The tablet market will continue to be dwarfed from a unit standpoint by handsets, TVs, and even more traditional form factor PCs until probably 2012.

We view tablets currently as an incremental demand driver for displays. Since their emergence as a major display technology in the early 2000s, LCDs remain the dominant screen technology and will show up in the majority of early tablets that we see. LG is the leader in developing and providing the latest LCD displays to not only Apple and the iPad, but to many of the other newer tablets over the next 6 to

12 months. To a lesser extent, we also expect many of the other major panel makers to participate in this early stage of the tablet market.

AMOLEDs or Active Matrix Organic Light Emitting Diodes remain the technology that we expect to replace LCDs as the primary smaller screen display technology. AMOLEDs are currently being used in a number of handsets from Samsung and also most notably in HTC's Incredible and now the Galaxy S line.

The Incredible is running into some production restraints by Samsung. Samsung's restraints, as well as those from LG and AUO, which are also ramping, are likely to restrict the use of AMOLEDs in tablets until probably 2012. By then, Samsung and LG are both expected to have new generation 5.5 AMOLED fabs on stream. From an investment standpoint, the most interesting play we see relative to displays and the AMOLED market is a company call **Universal Display**, symbol PANL. PANL produces the most attractive AMOLED materials that are currently being included in handsets, and we believe they will gradually become the dominant supplier of AMOLED materials to display manufacturers.

Valuation on this name (PANL) is a tough pill to swallow, but if you're interested in the AMOLED market or displays in general, we would point you in the direction of Universal Display. **If you'd like to get into a deeper discussion on display technology, we would be more than happy to have one or arrange for one of our experts in the field to drill down. Whether it's on AMOLEDs, LCDs, or any other of the display technologies available or being developed.**

## Appendix A – Tablets, vendors and opinion as of 9/1/2010

Vendor	Product Name	Opinion/Comment
Apple	iPad	Apple set the tablet standard with the iPhone Touch, now the iPad extends the reach to larger devices. Look for more models in the not distant future.
Acer	NA	Acer is pursuing a dual strategy with Windows 7 (though currently not announced as WinMo 7) and android.
Archos	5	Archos has made wonderful if not eccentric personal media players for some time. Most of the reviews we've seen are quite constructive. Perhaps the French company has the right mojo this time. For these tables to gain great marketshare Archos must get out of up charging customers for basic software.
Archos	NA 5	Archos has made wonderful if not eccentric personal media players for some time. Most of the reviews we've seen are quite constructive. Perhaps the French company has the right mojo this time. For these tables to gain great marketshare Archos must get out of up charging customers for basic software.
Archos	7-Home 9-pctablet	We are guessing a commodity.
Asus	NA	
Augen	Gentouch 78	Kmart is selling this rolling disaster for \$150. The hardware performs acceptably, about liken and HTC Hero but Augen did not properly license Google software which makes this unit a beast.
Dell	Streak	Too small, old technology. We'd rather have an iTouch with a smaller screen.
HP	PalmPad	Developers just don't care about orphan operating systems. Our best guess is that HP will use this table for market specific applications.
HP	Slate 500	With a Q4 delivery date we expect HP will sell some slates. As consumers better understand tablets, we think HP's dedication to Windows 7 will limit its success.
HTC	NA	For such a manufacturing oriented company, HTC makes big technology bets. To the best of our knowledge its Chrome based tablet hits the stores on Black Friday, 2010.
Lenovo	Skylight	Expect two variants or one with a very expensive docking station.
LG	Optimus	We admire Lenovo for its innovative interfaces and industrial design on GSM phones not generally sold in the US. IF the company can build distribution beyond carriers we would expect good results. This is a big IF.
Motorola	Various	Motorola possess significant advantages over most tablet makers. It has a well-oiled distribution machine for mobile phones, a better known brand, hooks into the set-top box and satellite markets. If its tablets are competitive, we think Motorola's presence and brand will give it an edge.
Nokia	NA	Nokia has been in the tablet and ancillary markets for a long time. Its products though, have lacked applications and customer appeal. Look for 7" and 9" models.
Notion Ink	Adam	Notion Ink has garnered considerable positive attention for its Adam. Here the issue is not the tablet but the company's ability to obtain financing so that it can build and market what appears to be one of the most attractive tablet packages on the table. NotionInk's approach may be too close to the real market for HP to buy them.
Source: TownHall Research		

<b>Vendor</b>	<b>Product Name</b>	<b>Opinion/Comment</b>
OpenPeak	OpenTablet 7 OpenFrame 7 ProFrame7 OpenFrame 7E	OpenPeak makes telephone and energy management systems. For example it produced Verizon's home hub. Its OpenTablet 7 appears to be an extension of its purpose built devices. While it and AT&T both acknowledge a working relationship for the OpenTablet 7, we are less confident because it uses Linux rather than Android.
RIM	BlackPad	We are highly skeptical of RIM's ability to succeed with the BlackPad. If RIM can provide BES support the QNX operating system it will likely carve out meaningful enterprise share. Beyond that RIM has a lot to prove.
Samsung	Galaxy Tab	We expect this android tablet to be successful for Verizon but probably not for Samsung. Should Samsung get retail distribution, we think the Galaxy Tab will be an important competitor.
Toshiba	SmartPad	This is one of the more intriguing tablets in the rumor mill as Toshiba, like Apple, comes at this from a consumer rather than a carrier point of view.
Verizon	Zpad	The Zpad is a reference design that may never become a real product. As such it fits today's market well.
ViewSonic	ViewPad 7	Monitor maker ViewSonic has distribution and supplier credibility to distribute what look to be reasonable products. The one issue we see is that Viewsonic is planning to use Intel Atom processors rather than ARM based units.
ViewSonic	ViewPad 10	
Olive	Olive Pad	This Indian based tablet company is doing well in the local market selling its Android based tablet as a 7" half price alternative to the iPad.
Source: Town Hall Research		

## Appendix B – How Michael Porter might view the tablet business

Analyzing tablets using Michael Porter's five factors makes us believe that tablets will ultimately turn into a highly competitive business. After Apple, it is hard to see room for differentiation. This supports our primary investment thesis that semiconductors and screens are likely to turn out to be better investments than the tablet companies.

### Power of Buyers – Moderate to High

Consumers sit at the end of three primary distribution channels, carriers, retail, and internet, of which tablet makers must penetrate at least one.

### Selling to high power carriers

Establishing a relationship with a carrier is difficult. Generally speaking, carriers like to keep their vendor list to a minimum. The first step is to get the carrier to listen and make a decision to trial the device. Then once that is accomplished, devices must perform to rigorous standards, be tuned for a specific carrier's frequency and technology so that trials can start. Assuming the field test goes well, the supplier has to train and support the carrier's retail system all the while providing follow on service and parts to the carrier.

### Selling to medium to high Power Retail

Fortunately retail is one way to "end-run" carrier sales. There is no device tuning and minimal (compared to carrier) testing. Vendors, however, must demonstrate they are able to reliably serve the needs of high volume retail chain. This is easier said than done. Supply arrangements to drop ship, financing inventory, adjusting to the retailer's supply chain, training staff, and managing web content are some of the challenges to doing business with large retailers. These requirements decline with the size of the retailer.

### Selling Direct to low power Consumers

In a direct sales model, the manufacturer controls their own destiny. Creating a website to sell products is a relatively straight forward exercise. Building a sales force only costs money. The number of product and technology blogs, however, makes sales and service execution critical.

### Power of Suppliers is high but likely to decline

There are many ARM chip licensees. Right now tablet demand is quite high and suppliers control parts pricing and availability. We expect this will change as processor supply catches up with demand. Even with our positive demand outlook, we see this happening mid to late next year. Not surprisingly, this coincides with our expectation that it will take that long for Intel to bring a more competitive chip to market. As many of the Tablet chip makers are fabless, we expect this timing will coincide with supply matching or exceeding demand.

The other critical component is the viewing screen. We believe AMOLEDs are the most desirable screen technology. Currently AMOLED supply is constrained and likely to remain so until sometime in 2012 or once Samsung has enough capacity to begin fulfilling order from other tablet competitors.

## Barriers to entry are low

We see barriers to entering the tablet market as low. Designing and building a tablet today is easier than building PCs at the time Michael Dell was first building PCs. Reference designs abound and manufacturing houses are readily available to assemble tablets.

## Availability of Substitute Goods is high

With respect to most personal automation, tablets are the substitute goods. Within the tablet market we expect that tablets can substitute for each other. Hence, we expect many substitute goods and believe pricing power will be low. Consumers are likely to make tradeoffs based on applications desired, price and function. For example Apple's UI is a work of art but its iPad is priced high. **Hence, we think many consumers, will purchase low priced Android tablets for lower prices as an alternative to Apple or other computers.**

## Rivalry among firms is high

Most electronics companies find themselves in intense rivalries with a well-defined set of companies. Samsung, Motorola, and HTC have all painted a bull's eye on Apple and all are vying for high end tablets. We believe Apple thinks most tablets are competitors and considers all tablet makers. At the low end, Augen, Asus, Archos, and Viewsonic are likely to lock themselves in battle. Because of low differentiation within market tiers, we expect rivalry among firms to be high.

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**All of our opinions are for a 12 to 18 month time horizon.**

**BUY** ~ Company is well positioned in a high growth market or gaining share and no discernable threats to current fundamental momentum. Stock is expected to meaningfully outperform its peers and the market averages

**AVOID** ~ Conflicting fundamental cross currents make a compelling long or short recommendation unclear.

**SELL** ~ Company's markets are shrinking or it is losing share and/or we anticipate fundamental deterioration. Stock is expected to meaningfully underperform its peers and market averages.

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