

Apple Tablet Myths

The Impact of a Multi-Touch Enabled Tablet Device
on the Market

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Summary

On January 27th, 2010, Apple is due to announce a new piece of hardware. Many are presuming it will be the long-predicted "Apple Tablet," "iTablet" or "iSlate" as it has been labeled by the press.

While many people have ventured predictions about the features, look and feel, of such a device, few have looked at the real reasons why Apple feels that now may be the time to release such a device into the market.

The predominant belief is that Apple's Tablet will succeed simply due to the popularity of the iPhone and the incredible buzz around the product. Conversely, a significant minority of analysts believe the tablet is merely a product of overhyped PR and, with a lack of useful applications, will soon fail.

In this white-paper, we attempt to debunk both of these myths by providing an analysis of what we think Apple's vision is for the tablet. At the same time, we explore the potential ecosystem of an Apple device in a tablet-like format in order to understand what killer apps may hold the key to its success; discover how Apple's device can differ from competitors; and study what impact it will have on the budding but already crowded mobile device market.

A Tough Tablet to Swallow

The conception of Apple's Tablet could be traced back to the ill-fated Newton "Personal Digital Assistant" of the early 90s. A product line ultimately killed by Steve Jobs upon his return to Apple, the Newton had breakthrough features such a pen-driven touch screen, handwriting recognition, and an innovative OS which ran on low power consumption processors for handheld devices.

However, the Newton would share the fate of dozens (if not hundreds) of tablet-like computers which followed: consumers and business users struggled to find real-world applications which would leverage these new technologies effectively. The handwriting recognition, in particular, was widely ridiculed in the popular press, and with no suitable application which clearly benefited from freehand notation, there was simply no clear reason why people should have bought a Newton.

More recent years have spawned a multitude of computers with either tablet or "hybrid" form factors that allowed the user to detach the keyboard or flip it out of sight. The "Tablet PC" name became the most popular version of the tablet, running a version of Windows XP Professional with various add-ons, including handwriting recognition, rudimentary speech recognition, and the "Windows Journal" which provided a place for digital ink notations to be stored.

Unfortunately, many of these Tablet PCs quietly met the fate of the Newton. While "in the labs" they showed promise, in the wild, they simply failed to flourish. Businesses and developers who invested in them could only find niche uses for the touch technologies, and without effective handwriting or voice recognition, the lack of a physical keyboard became a hinderance.

Tablet APIs, functionality, and features continue to be integrated into the Windows 7 platform, as well as Mac OS X (where no Tablet hardware exists), but the few available



statistics on market share show tablets occupy less than 1% of computing device sales.

What's in it for Me?

So if the tablet as a concept never found traction in the market, what future applications are going to give it more appeal?

In 2002, Microsoft argued that the tablet is the ultimate mobile device especially for those “road warriors” and “corridor warriors” who didn't have their desktop or laptop with them at all times. At the time, it was thought that the laptop form factor (especially considering the laptops of 2002) was large and bulky. The author even goes as far to say that, “one reason for [the tablet's potential] is the negative social aspect associated with laptop use in meetings.”¹

This quote is indicative of the flawed assumption that many of the Tablet PC manufacturers made for many years past 2002: that the Tablet PC was to be a super-portable version of the laptop which would find its way into the workplace based on its good looks and discreet size.

As we know today, such predictions could not have been more wrong. Not only have laptops become the norm in many business meetings, but they have also become required in many higher educational institutions. In addition, laptop form factors have become smaller and more portable, retaining the keyboard – the input device of choice for all digital generations.

Some attribute the lack of acceptance of the Tablet PC design to technical shortcomings, because their processing power and battery life simply can't handle the needs of advanced functions like accurate handwriting and voice recognition.

However, the Tablet PC suffers in obscurity not because of the lack of these features. In fact, one can argue that today, with processing power available in orders of magnitude above those of 2002, that technologies which were marginal at the time (such as the Newton's handwriting recognition) could easily have been improved had demand been there. In fact, Windows 7 includes even more “Tablet PC Improvements” such as Tablet math, better handwriting recognition, and multitouch.²

Yet the existence of these technologies on hardware which has better battery life, more processing, and advanced multi-touch sensitive screens have created nothing more than a few more “Tablet PC”-like products with little more function than more advanced Kindles.

So if businesses and consumers haven't bought into the Tablet PC as a concept, what can Apple do to make it a success this time around? The clues might be found by looking at what Apple did right with the iPod and iPhone; and then also by analysing recent consumer trends, which have changed significantly since the Newton.

¹ <http://www.google.com/search?hl=en&q=tablet+pc+%22market+share%22&aq=f&oq=&aqi=>

² <http://windows.microsoft.com/en-us/windows7/products/features/tablet-pc>



The iPod is Flat

Before the iPod and iPhone, MP3 players and mobile phones had very similar issues within their respective categories. While in both cases (unlike the Tablet PC), overall unit sales of MP3 players and mobile phones weren't a concern, the categories were highly competitive, with different devices competing on lists of features and price. Apple shook up the market, and ultimately won the war, by questioning the fundamental assumptions for consumer behaviour.

The assumption was that MP3 players were for playing music which the user had already purchased and would then "rip" and place on the device. MP3 player manufacturers before the iPod's inception optimised the "playing" experience, focusing on music capacity, portability, and audio quality.

Apple realised that the primary purpose of the iPod was not just to be a media player. Rather, they understood that the iPod was digital delivery device which completed the connection of record companies and their music to people's ears (and wallets). While at the time of the iPod's release, it did lead in storage size compared to other MP3 players of the era, the reason that it has continued to be the market leader is not features, but rather the ecosystem in which it lives. In the case of the iPod, the ecosystem is the iTunes Music store and the record companies who continue to feed it with new music and videos every day.

Similarly, before the advent of the iPhone, the assumption had been that mobile phones were for making calls and sending emails. Once again, Apple's realisation was that the mobile phone had a greater purpose; it would be yet another easy to use, seamless platform for digital delivery, this time delivering maps, full websites, email, and mobile information wrapped in apps.

In both cases, Apple realised that the device wasn't the end product. Rather, each device was simply the last few feet of a pipeline of digital content delivery. In addition, the fundamental design of each device and its interfaces takes in account this shift in understanding about the role that each device takes in its ecosystem. Ironically iTunes, the same channel which the music industry loves to hate for its aggressive margins, and which similarly developers complain about for its slow time to test and release their apps, is the primary reason that the devices were successful in the first place.

Both devices actually removed features to allow the consumer to access content quickly and easily. The best example of this is the iPhones single touchscreen interface. Apple, when developing the interface elements for the phone, left out any traditional keypad or keyboard and instead created the first useable software-based keyboard on a popular mobile device. While initially a hotly debated interface decision, the basis of their decision was this: Apple wasn't interested in optimising the interfaces for the phone and messaging interfaces, which already had crowded and highly competitive market spaces. Instead, they chose to optimise for mobile applications and content delivery, which meant a single large touchscreen with incredible, ground-breaking capabilities, such as multi-touch and high resolution screens.

In many ways the interface is so straightforward that in some contexts it seems downright rigid. In fact, the interfaces and Operating Systems on both devices allow



very little customisation, especially compared to what “knobs and dials” are available on most desktop systems. It’s not that Apple is philosophically opposed to customisation or open platforms. Mac OS X, Apple’s desktop operating system, is much more open than the PC, with some of its underlying source code available in open source and plenty of opportunities for software installation and customisation. Rather, Apple recognises that when a device like the iPod or iPhone is part of a consumer ecosystem, it must serve that primary purpose to a level of perfection, even to the detriment of flexibility. By the sales figures, this design choice works well for consumers and Apple alike.

Sowing the Seeds of the Tablet Ecosystem

Of course, understanding that an ecosystem is needed to create superior platform to its competitors is quite simple. Particularly for a new device like the fabled tablet, the critical questions are (1) What is the equivalent ecosystem? (2) What needs to happen to create this ecosystem? (3) How can this device be designed in order to fit most naturally into that ecosystem?

The answers to these questions lie not in Apple’s products, but in how consumer trends and digital media have moved on since the days of the Newton. Our hypothesis is that Apple’s next-generation device, if it is released in early 2010, will rest on a complex delivery mechanism for digital content and content creation, in a way that no other company has approached before.

To understand this ecosystem, it’s important to look at four key trends in the computing market today. We label these trends as follows:

- Netbook 2.0
- Kindle IIc
- Social Media Computing
- Revolutionary Interfaces.

Netbook 2.0: Ready for Something More

One of the errors made by both the Newton and Tablet PC teams was that desktop users needed a device that would be more portable than a laptop, but with the same capabilities, what we call the “mobility fallacy.” Both Newton and Tablet PC sales figures prove that this assumption was false, and more recently the 23% year-over-year sales drop in higher-priced ultra-portables also seems to prove that most consumers value low cost over portability.

However, the recent success of the “netbook” form factor and Amazon Kindle show that alternative portable devices are gaining traction with consumers. Surely that contradicts our “mobility fallacy”?

Certainly, the netbook’s success is to some degree attributable to its mobility. In 2009, it’s estimated that over 30 million of these super-small computing devices were sold by HP, Dell, Lenovo, and many other companies.³ However, we believe the

³ http://www.displaysearch.com/cps/rde/xchg/displaysearch/hs.xsl/quarterly_notebook_pc_shipment_and_forecast_report.asp



popularity of netbooks are primarily driven by their low cost, selling for under US \$500 and in many cases, under US\$300.

As replacements for traditional laptops, netbooks function poorly. Their small screens and poor processing power mean that they are useful for little more than word processing and surfing the web. Even on the internet, some Adobe Flash-based sites are unable to render the images on many of the cheapest netbooks. Even with these limitations, a large subsection of consumers use computers for nothing more than basic computing and web browsing, and the netbook appeals to them.

It's obvious that a tablet device will not be able to compete with netbooks in their core strength: basic computing at a low cost. Firstly, netbook users are prolific typists, so making them use touch-based input would slow them down. Second, the cost of touch-based elements raises the cost of the device beyond the \$300-\$500 price point needed to be competitive.

However, there is an opportunity here among a significant contingent of netbook buyers. There are users who tried using netbooks because of their price and mobility, but walked away unsatisfied by their performance or capabilities. Add to these users who are growing out of the netbook experience, finding that as they become more digitally savvy the netbook is simply too limited.

These users, probably numbering in the 100,000s, are perfect candidates for an innovative device which doesn't simply replace the basic computing functionality which draws the netbook's core audience. That device? That's what we call a "Netbook 2.0," and Apple has the opportunity to create a tablet which can function as a Netbook 2.0 if it supports bluetooth keyboards and can stand like a traditional laptop screen.

Kindle IIc: Advertising Comes to the E-book

Like the netbook, the Amazon's Kindle serves new niche for the increasing number of digitally-savvy consumers.

The Kindle has all of the qualities of a strong ecosystem consumer device. With low-cost, extremely good battery life, and wireless data capabilities Amazon has created a digital delivery device for their immense content delivery system. Consumers love it, as sales estimates are around 500,000 for 2009.⁴

Like the netbook, we think that the primary drivers of the Kindle's appeal are the value of what it delivers to the end user: the ecosystem of digital books and other media sold by Amazon delivered seamlessly to your device. The yet unanswered question is whether or not Amazon's market position with e-book readers will be as dominant as the iPod and iPhone have been in their category.

The opportunity here for Apple is that as e-book popularity increases, media creators will look at the format as an alternative to traditional newsfeeds, which are a detrimental model for publishing companies. Delivering content in complete pages rather than digital text allows media creators the retain important advertising opportunities, which is critical for them to maintain existing revenue sources.

⁴ <http://www.guardian.co.uk/technology/2009/dec/23/amazon-kindle-ebook-sales-guessing>



Colour displays are going to be very important for this shift in the delivery, as advertisers will pay much higher rates for ads delivered in colour and view this as a serious medium for their message, rather than a device like the Kindle which requires compromising image quality. Almost all of the e-book readers on the market today use E-ink's patented Vizplex imaging film, which provides high resolution, low power black and white imaging.⁵ However, colour versions of these displays are likely to be more expensive and more difficult to manufacture, bringing the cost of such a device above what many consumers would pay for an e-book device.

Apple's device, by integrating more traditional OLED or LCD technologies, could deliver that experience [albeit with lower battery life] with significantly better connectivity and additional functionality. In addition, the timing of a device which could deliver a similar ecosystem to Amazon's but with advertising, could not be better. Just during the last few months, more and more publishing companies are announcing their intent to charge for content, including such powerhouses like the New York Times.⁶ The publishing industry is looking for a Kindle 2 with colour which we call "Kindle IIc."

In our opinion, a massive shift is underway behind the scenes of the publishing industry to provide their own digital delivery with advertising and close off the methods which allow for digital text reproduction. Apple could be part of the driving force of this trend, just as they were with record companies with digital music.

Social Media Computing: A Fundamental Shift in Digital Behaviour

Social media is a massive shift in consumer digital behaviour. The incredible user base of sites like Facebook and services like Twitter show that users are changing how they interact with the Internet. Not simply consumers of content, many users are moving to an "incremental content creator" model where they create small amounts of digital content constantly during the day.

Unlike the previous digital era of blogs and podcasts, where anyone could create content but only a few really did, this era of Social Media Computing turns everyone into a content creator. Social media content is also not just digital text. While services such like Twitter are popularising the concept of "microblogging" in 140-character increments, there's much more to Twitter than SMS-sized messages.

With URL shortening services like bit.ly and is.gd; image posting and sharing services like twitpic; and the ability to link into posted online content, twitter becomes a portal to rich content like photos, audio, and videos on popular sites like flickr, last.fm, and youtube. In fact, these social media sites are making this rich media even more accessible and spreadable, through Facebook status messages and Tweets.

We believe that this spells out an opportunity for Apple to make an innovative device which can bring editing such rich media for everyday social media users. That includes photo manipulation, quick cropping and resizing, and even on-the-fly video editing. Apple has already begun this trend by adding innovative video recording

⁵ http://en.wikipedia.org/wiki/List_of_e-book_readers#Devices_using_Vizplex_Imaging_Film

⁶ <http://www.reuters.com/article/idUSTRE60I2DG20100120?type=technologyNews>



features with the latest generation of the iPod Nano, but the tablet would provide an opportunity for advanced touch- and gesture-based editing.

So what consumers may want, but don't have, is the ultimate mobile device to interact with social media, with the capability to consume and create digital content in many more ways than a mobile phone can provide. If Apple is able to bring photo and video editing to a tablet-like device, with the well-known "easy of use" of Apple's applications like iMovie and iPhoto, and with innovative touch interfaces, they could produce the ultimate social media device.

Revolutionary Interfaces: Fantasy Come True?

Interfaces have moved forward from the simple slide and "pinch" multi-touch movements on the original iPhone.

In last year's TED conference, Pattie Maes and Pranav Mistry demonstrated an innovative touch-like interface, which combined gesture recognition with context- and online-information-driven software.⁷ Current mobile touch-based interfaces still pale in comparison to fantasy interfaces in Avatar and Minority Report as well as more real-world (but expensive) devices like Microsoft's Surface, so there is significant opportunity for Apple to innovate with interfaces, especially as it would be possible for the tablet's camera to detect gestures.

Another opportunity is keyboard input. While we fully expect the tablet to have bluetooth capabilities so that wireless keyboards can be used with the device, we also think that Apple may integrate a full-size, on-screen, touch-based, auto error-correcting keyboard, similar to the small version on the iPhone, but which can be used like a regular keyboard.

A tablet with smarter, more context-aware gesture and touch interfaces and both on-screen and wireless options could revolutionise larger-screen interfaces just like the iPhone revolutionised mobile phone interfaces.

Apple is in a good position to deliver such innovations. In 2005, Apple acquired FingerWorks, a small company with advanced gesture recognition and multi-touch capabilities. FingerWorks' technology was rumoured to have been used in the iPhone, and one can only assume that Apple has continued to innovate in this area over the past two years.

So, What's it Good For?

The potential ecosystem for this device takes shape as the ultimate portable digital content delivery and social media device. Regular productivity applications can be used with a wireless or on-screen keyboard. Music, video, and e-pubs come through the iTunes store on a wireless connection. Social media content can be consumed and created easily. And advanced interfaces make it easier to work with in a variety of different applications.

So how will this device be used by consumers and businesses? Our analysis shows some of these potential applications:

⁷ http://www.ted.com/talks/pattie_maes_demos_the_sixth_sense.html



A Revenue-Generating News Device

So far, the publishing industry has failed to monetize the digital delivery of text information, as news aggregators have taken away the potential to charge for delivery of content. We think that Apple will release with their device a section of the iTunes store for delivery of magazines, newspapers, and books with incredible imagery and advertising not seen on previous e-book devices. This, in turn, will create new revenue streams for the publishing industry - children's e-books and advertising-funded subscriptions, for example - and provide Apple with a critical ecosystem for this device.

Business Applications

There are endless potential business or professional applications for any type of activity that is normally performed away from a desk, but requires a larger screen than an iPhone. From medical professionals taking notes on patients or writing prescriptions, to enterprise reporting and analytics tools, point of sales devices, CRM, or even military or policing applications. Just as Apple has started to encourage development of business apps for the iPhone, and offers an enterprise license to avoid iTunes, the same will be true of the Tablet. We also expect that the Tablet will be able to run more than one application at a time, allowing multi-tasking.

In-Car GPS and Audio Device

The Apple tablet will also be the ultimate GPS, audio, and video device for the automobile. Even if only as a centre-console mounted, larger version of the iPhone, the tablet could be a favourite of anyone who spends significant amount of time in the car. Innovative touch and gesture-based interfaces could allow for easy hands-free operation.

If Apple adds digital text to voice capabilities (like they have already on the latest generation iPod Shuffle), then the tablet device could also be used to read email and website content to users as they drive.

Home Automation

For years, home automation has been the realm of high-end A/V companies like Cestron. Apple's device, mounted in the wall or simple standing on a table, could be real competition as a home automation controller. Combined with various home-automation sensors and actuators, the Apple device, using built in audio and video streaming, could be not only the ultimate remote control but also a content source for home A/V as well.

Many competitive devices already cost similarly to the Apple tablet's rumoured price, and other companies like Intel have already been developing Atom-based dashboards using a similar concept.⁸ We think that the Apple device could make significant inroads in home automation, especially if it can be used to measure and publish

⁸ <http://www.engadget.com/2010/01/11/intels-atom-powered-home-energy-dashboard-concept-gets-itself-a/>



energy consumption, using sensors like those used on products like CurrentCost's Envi.⁹

Around the House

Given the number of recipes available online, it's surprising that more computers aren't used in the kitchen. However, many cooking ingredients can easily wreak havoc on a keyboard-based device, and even small netbooks take up valuable counter space. A tablet format could easily be propped up (even wrapped in cling film) to work well in any kitchen.

A tablet device with a bright display could also be perfect as a combination digital picture frame, clock, and alarm sitting in a charging stand next to the bed. Its e-pub features would make it a permanent fixture on the coffee table or family room.

Compete or Die

So how will Apple succeed in creating another category-defining device like the iPod and iPhone? To some extent it will be the fact that they have created a device with a deep and content-rich ecosystem, and some of it will depend on a wide variety of consumer uses.

However, there is much more to making an innovative product a runaway success than just the ecosystem and market needs. Consumers need be aware of the device, have a strong sales experience, and be able to expand its uses through other applications.

Apple is in a strong position on all of these fronts.

First, Apple has a history of dominance in mobile devices, unlike other tablet makers. As brand recognition goes, the Apple brand is much more synonymous to mobile computing than HP and other tablet manufacturers because of its popularity with music, mobile, and laptop devices.

Second, Apple has an unparalleled distribution network of Apple Stores and independent dealers. No other tablet manufacturer will be able to regulate the consumer experience and control the distribution channel as much as Apple can (and maximise their gross profits in the process). For a new device which will depend on highly trained sales people and solid marketing, Apple is in a unique position to be able to deliver. Competitors, such as HP, Dell, and Google, simply don't have the ability to interact face to face with consumers like Apple does.

Finally, Apple's developer network is incredibly strong, riding on the success of the iPhone. Both the Mac and iPhone use Apple's common Xcode development platform, and we expect that the tablet device would also share the same platform. This means that developers familiar with Xcode could write apps for the Mac, iPhone, and tablet device. Just the user base of iPhone and iPod touch alone in the first two years of sales is around 37 million.¹⁰ This means that developers have a huge customer base, growing at an incredibly fast rate. If Apple's tablet device is based on a similar SDK,

⁹ <http://www.currentcost.com/>

¹⁰ <http://www.techsuperpowers.com/energize>



Apple will have thousands of solid developers and applications for their device from day one.

One Apple, Two Apple: Multiple Unit Sales

With the tablet ecosystem in its infancy, a multitude of possible applications, and thousands of already existing applications (based on the iPhone platform), it's hard to think of a household that wouldn't want one or more of these devices.

Like the iPod and iPhone, what will line Apple's pockets is the potential for multi-unit sales for higher income households. While the number of consumers who will be able to afford two or more devices will be slim, Apple has a history of being able to design products which appeal to all of those who can afford them.

We predict that some luxury consumers will buy more than one device for families who travel, for instance, one for the driver for navigation and car audio, and others for kids and passengers. In addition, some families could buy multiples for home automation use (even as many as one for every room). Even if this device only does the traditional functions of browsing, e-book, and social media interaction, it's hard to imagine any wealthy family who wouldn't want more than one.

Android. Killer Robot?

We predict that if Apple does release the tablet as rumoured, it will do so with a multi-function device which will appeal to consumers on every level: Design, functionality, utility, flexibility, and its ability to connect them to new content. So what could keep it from dominating the market? One word: Google.

Just as Android is doing its best to form a duopoly in the smartphone market, it will eventually be the main competitor to Apple for the tablet. While both Apple and Google share status as the "cool" brands on the Fortune 500, that is where the similarities end, and in fact their approaches couldn't be more distinct. Google has chosen to eschew the partially open, partially supervised world of iTunes in favour of a completely open environment for applications and content providers. Google is also making the bet that over time all computing will move to the cloud (i.e. services delivered exclusively through your browser over the web), whereas Apple will rely on installed apps for the foreseeable future.

Magazine publishers are keen to avoid giving away the farm to Apple in the way that the music industry did with iTunes. Last month Conde Nast, Hearst, Meredith, News Corp., and Time Warner announced that they would be collaborating on the technology platform to deliver their content, presumably to remove any leverage that Amazon has via kindle and Apple has via iTunes. Android, with its open environment, seems well placed to benefit from this approach.

In the end, Google is the only company that can compete. They understand the ecosystem of a product as well as Apple does, and while they don't have the same retail reach of Apple, their products are just as innovative, as the recent Nexus One launch has proven.

Where Google may falter is the consumer experience. Apple has tremendous amounts of experience developing customer-facing, consumer support for technical



issues, with their Genius Bar and AppleCare phone support. Google has little or no history of providing direct consumer support, especially to millions of end users. In fact, the Nexus One launch was a well-publicised support failure.¹¹

However, it's difficult to count Google out of the game, as they are one of the best financed and most effective technology companies in the world. So our prediction is that Google and Android-based tablets will certainly gain a share of the market, but like the Nexus One vs. the iPhone, its strength will in leveraging its cloud roots.

Conclusion

Alexander Bartfeld, co-founder at Codex, says: "If the Apple tablet just a MacBook air without a keyboard, it's not going to sell."

Tablet PCs and the Apple Newton proved that simply taking away the keyboard and making a device more mobile didn't sell devices. In order to create a truly successful consumer electronic device in a tablet form factor, Apple will have to consider the entire ecosystem of the device, from content to applications and from the sales experience to support.

We feel that Apple is well positioned to take advantage of key trends in computing - Netbook momentum, the Kindle's success, the Social Media Revolution, and innovative Touch Interfaces - to create a unique ecosystem of high-value digital content delivery and multi-media content creation. They also have a well proven distribution and support network and a track record of mobile device success which translates into brand recognition as a technology innovator.

Combined with their extensive developers network and the Apple Store, the Apple tablet could be the next big thing in technology. Whether or not it will leverage all of these factors and sell millions to become a category defining device, only time will tell. Even if it does so, Apple should keep an eye on that rear view mirror: Google's Android-based tablets are going to be only so far behind.

¹¹ <http://www.forbes.com/2010/01/20/nexus-one-cellphones-technology-wireless-google.html?boxes=Homepagechannels>



About Codex

Codex is one of the first software development companies dedicated to building mobile applications for businesses. Founded by Alexander Bartfeld and Michael Oh, veterans of the enterprise software and Apple industries, Codex is headquartered in London with offices in Boston. Codex is also affiliated with Tech Superpowers, one of Apple's most long-standing partners.

The management and developer teams have worked with some of the world's largest organisations including Barclays, Accenture, KPMG, Unilever, Bose, Novartis, and NATO.

Codex provides products and services that enable our clients to capitalise on the explosive popularity of the iPhone device and Apple platforms, by communicating with customers, employees, shareholders and suppliers using a variety of innovative and leading edge applications.

Codex leverages both our technical and business experience to work with our customers to ensure they build competitive advantage by developing pioneering applications to meet their business needs.

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