**CHAPTER: 1**

**1.1 INTRODUCTION: Tablet Personal Computer**

A tablet PC is a laptop or slate-formed mobile computer that is outfitted with a touchscreen or screen that can be controlled with a digital pen or stylus, or via finger touch.  A tablet PC does not require a keyboard or mouse. End-users can directly key in data on a tablet PC. It also offers greater mobility than a conventional laptop.

A tablet computer, or simply tablet, is a medium-sized [personal mobile computer](http://en.wikipedia.org/wiki/Mobile_computing) integrated into a flat touch screen and primarily using stylus, digital pen or fingertip input along with a virtual onscreen keyboard in lieu of a physical keyboard.

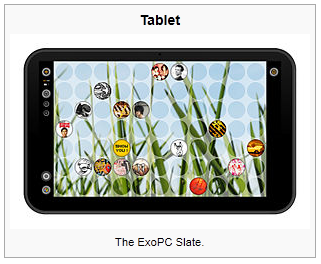


Figure 1.1: The ExoPC Slate TabletPc

As of 2010, two distinctly different types of tablet computing devices exist.

Firstly, older [tablet personal computers](http://en.wikipedia.org/wiki/Tablet_personal_computer) are mainly [x86](http://en.wikipedia.org/wiki/X86) based, and are fully functional [personal computers](http://en.wikipedia.org/wiki/Personal_computer) employing a slightly modified [personal computer OS](http://en.wikipedia.org/wiki/Operating_system#Examples_of_operating_systems) (Like Windows or Ubuntu Linux) supporting their touch-screen, instead of a traditional display mouse, and keyboard. A typical tablet personal computer needs to be stylus driven, because operating the typical desktop based OS requires a high precision to select [GUI widgets](http://en.wikipedia.org/wiki/GUI_widget), such as a the [close window button](http://en.wikipedia.org/wiki/Button_%28computing%29#Buttons_in_Microsoft_Windows).

Since mid-2010, new tablet computers with [mobile operating systems](http://en.wikipedia.org/wiki/Mobile_operating_system) forego the [Wintel](http://en.wikipedia.org/wiki/Wintel) paradigm, have a different interface and have created a new type of computing device. These [mobile OS tablet computer](http://en.wikipedia.org/wiki/Mobile_operating_system) devices are normally finger driven and use [multi-touch](http://en.wikipedia.org/wiki/Multi-touch) [capacitive](http://en.wikipedia.org/wiki/Capacitive_sensing) [touch screens](http://en.wikipedia.org/wiki/Touch_screen), instead of the simple [resistive touchscreens](http://en.wikipedia.org/wiki/Resistive_touchscreen) of typical stylus driven systems (also a standard external [USB keyboard](http://en.wikipedia.org/wiki/USB_Keyboard) can be used). First of these was the [iPad](http://en.wikipedia.org/wiki/IPad), with [Samsung Galaxy Tab](http://en.wikipedia.org/wiki/Samsung_Galaxy_Tab) and others following. In foregoing the [x86](http://en.wikipedia.org/wiki/X86) precondition (a requisite of Windows compatibility), the new class of tablet computers use a version of an [ARM architecture](http://en.wikipedia.org/wiki/ARM_architecture) processor heretofore used in portable equipment (e.g., [MP3 players](http://en.wikipedia.org/wiki/Digital_audio_player) and [cell phones](http://en.wikipedia.org/wiki/Cell_phone)) now powerful enough (especially with the introduction of the [ARM Cortex family](http://en.wikipedia.org/wiki/ARM_Cortex-A9_MPCore)) for tasks such as internet browsing, light production work and gaming.

A tablet personal computer (tablet PC) is a portable [personal computer](http://en.wikipedia.org/wiki/Personal_computer) equipped with a [touchscreen](http://en.wikipedia.org/wiki/Touchscreen) as a primary [input device](http://en.wikipedia.org/wiki/Input_device), and running a (modified) classic [desktop OS](http://en.wikipedia.org/wiki/Operating_system#Examples_of_operating_systems). designed to be operated and owned by an individual. The term was made popular as a concept presented by Microsoft in 2000 and 2001 but tablet PCs now refer to any tablet-sized personal computer regardless of the (desktop) operating system.

**1.2 Types of Tablet PCs**

There are different types of table PCs available in the market today, based on industry and consumer requirements. The different tablet PC form factors are:

1. **Slate Tablet PC**

Slate tablet PCs are similar in appearance to a writing slate, and do not have keyboards attached with them. Users input data through handwriting recognition, stylus and finger touch. External keyboards can be connected to them either through USB or through wireless connectivity. Slate tablet PCs are mostly deployed in industries that require a lot of mobility or involve working in harsh conditions. Such industries include manufacturing, health care, field work related industries, education and so on. Such tablet PCs are built to withstand extreme physical conditions such as heat, humidity and also to be capable of withstanding any impact or damage from accidental dropping or intense movement.



Figure1.2: Lenovo X61 TabletPc

1. **Convertible Tablet PC**

Convertible tablet PCs are similar to conventional laptops except for the fact that the display screen is attached to the base of the computer at a single junction; this allows for the screen to be rotated at 180°, and be placed on top of the keyboard. This allows for a flat writing plane. Convertible tablet PCs are the most widely used type of tablet PCs as they offer the dual advantage of using both a conventional keyboard and a digital pen or stylus.

1. **Booklet Tablet PC**

Booklet tablet PCs are twin screen computers that open like a book, and are built with touch and digital pen detection abilities. Booklet tablet PCs can be used for web browsing, watching of internet television, e-reading and so on.

1. **Hybrid Tablet PC**

Hybrid tablet PCs incorporates the functionality of a slate and convertible tablet PC. They do so by using a removable keyboard thus providing the functionality of a slate tablet PC; when affixed they act as a convertible tablet PC.

## 1.2.1 Other features

1. [**Accelerometer**](http://en.wikipedia.org/wiki/Accelerometer): An accelerometer is a unit that detects the physical movements of the tablet. This allows greater flexibility of use since tablets don't necessarily have a fixed direction of use. The accelerometer can also be used to detect the [orientation](http://en.wikipedia.org/wiki/Orientation_%28geometry%29) of the tablet relative to the centre of the earth, but can also detect [movement](http://en.wikipedia.org/wiki/Motion_%28physics%29) of the tablet, both of which can be used as an alternative control interface for a tablet's software.
2. Ambient light and proximity sensors are additional "[senses](http://en.wikipedia.org/wiki/Sense)", that can provide controlling input for the tablet.
3. **Storage drive**: Large tablets use storage drives similar to laptops, while smaller ones tend to use drives similar to MP3 Players or have on-board flash memory. They also often have ports for removable storage such as [Secure Digital](http://en.wikipedia.org/wiki/Secure_Digital) cards. Due to the nature of the use of tablets, [solid-state memory](http://en.wikipedia.org/wiki/Solid-state_memory) is often preferable due to its better resistance to damage during movement.
4. **Wireless**: Because tablets by design are mobile computers, wireless connections are less restrictive to motion than wired connections. [Wi-Fi](http://en.wikipedia.org/wiki/Wi-Fi) connectivity has become ubiquitous among tablets. [Bluetooth](http://en.wikipedia.org/wiki/Bluetooth) is commonly used for connecting peripherals and communicating with local devices in place of a wired [USB](http://en.wikipedia.org/wiki/USB) connection.

#### 1.3 Developing programs for tablet computers

#### A significant trait to define whether a tablet computer can be regarded as a [personal computer](http://en.wikipedia.org/wiki/Personal_computer) is the ability for the final user to install arbitrary or self-developed software. The new class of devices heralded by the [iPad](http://en.wikipedia.org/wiki/IPad) has spurred the tendency of a [walled garden](http://en.wikipedia.org/wiki/Walled_garden_%28technology%29) approach where the vendor reserves rights as to what can be installed. The [software development kits](http://en.wikipedia.org/wiki/Software_development_kit) for these platforms are restricted and the vendor must approve the final application for distribution to users. Proponents of open source software deem that these restrictions on software installation and lack of administrator rights make this category one that, in their view, cannot be properly named personal computers. But newer [mobile operating system](http://en.wikipedia.org/wiki/Mobile_operating_system) based tablet computers may abandon the walled garden concept, and be like personal computers in this regard.

## 1.4 Tablets in developing countries

The low hardware requirements and easy operation of tablet computers has made it subject to various design studies for use in developing countries. Prototype tablet computers such as the [Sakshat](http://en.wikipedia.org/wiki/Sakshat) have been projected to cost $35, according to researchers in India which shall be soon available for the masses as the cheapest tablet working on Android with full functionality; however the [bill of materials](http://en.wikipedia.org/wiki/Bill_of_materials) currently comes to $47. [One laptop per child](http://en.wikipedia.org/wiki/One_laptop_per_child) (OLPC) plans to introduce a tablet computer for $100. Nicholas Negroponte, Chairman of OLPC, has invited the Indian researchers to MIT to begin sharing the OLPC design resources for their tablet computers. OLPC has been awarded a grant for an interim step to their next generation tablet, OLPC XO-3.

## CHAPTER: 2

## 2.1 Operating systems and vendors

Tablets, like regular computers, can run a number of [operating systems](http://en.wikipedia.org/wiki/Operating_system). These come in two classes, namely desktop-based operating systems and mobile-based ("phone-like") operating systems.

For the former class popular OS's are [Microsoft Windows](http://en.wikipedia.org/wiki/Microsoft_Windows), and a range of [Linux](http://en.wikipedia.org/wiki/Linux) distributions. [HP](http://en.wikipedia.org/wiki/HP) is developing enterprise-level tablets under [Windows](http://en.wikipedia.org/wiki/Windows) and consumer-oriented tablets under [webOS](http://en.wikipedia.org/wiki/WebOS). In the latter class the popular variants include [Apple](http://en.wikipedia.org/wiki/Apple_Inc.) [iOS](http://en.wikipedia.org/wiki/IOS_%28Apple%29), and [Google](http://en.wikipedia.org/wiki/Google) [Android](http://en.wikipedia.org/wiki/Android_%28operating_system%29). Manufacturers are also testing the market for products with [Windows CE](http://en.wikipedia.org/wiki/Windows_CE), [Chrome OS](http://en.wikipedia.org/wiki/Chrome_OS), and so forth.

[Boot times](http://en.wikipedia.org/wiki/Booting) for iPads are one-half the boot times for current Windows 7 netbooks, which can take over 50 seconds to display the [login](http://en.wikipedia.org/wiki/Login) prompt. The [BIOS](http://en.wikipedia.org/wiki/BIOS) initialization for a PC, which has remained unchanged since the invention of the PC, can still take 25 seconds.

### 2.2 Tablet PC operating systems

#### a) Microsoft

Following [Windows for Pen Computing](http://en.wikipedia.org/wiki/Windows_for_Pen_Computing), Microsoft has been developing support for tablets runnings Windows under the [Microsoft Tablet PC](http://en.wikipedia.org/wiki/Microsoft_Tablet_PC) name. According to a 2001 [Microsoft](http://en.wikipedia.org/wiki/Microsoft) definition of the term, "Microsoft Tablet PCs" are pen-based, fully functional [x86](http://en.wikipedia.org/wiki/X86) [PCs](http://en.wikipedia.org/wiki/Personal_computer) with handwriting and voice recognition functionality. Tablet PCs use the same hardware as normal laptops but add support for pen input. For specialized support for pen input, Microsoft released [Windows XP Tablet PC Edition](http://en.wikipedia.org/wiki/Windows_XP_Tablet_PC_Edition). Today there is no tablet specific version of Windows but instead support is built in to both Home and Business versions of [Windows Vista](http://en.wikipedia.org/wiki/Windows_Vista) and [Windows 7](http://en.wikipedia.org/wiki/Windows_7). Tablets running Windows get the added functionality of using the touchscreen for mouse input, hand writing recognition, and gesture support. Following Tablet PC, Microsoft announced the [UMPC](http://en.wikipedia.org/wiki/UMPC) initiative in 2006 which brought Windows tablets to a smaller, touch-centric form factor. This was relaunched in 2010 as [Slate PC](http://en.wikipedia.org/wiki/Slate_PC), to promote tablets running [Windows 7](http://en.wikipedia.org/wiki/Windows_7), ahead of Apple's iPad launch. Slate PCs are expected to benefit from mobile hardware advances derived from the success of the [netbooks](http://en.wikipedia.org/wiki/Netbook).

While many tablet manufacturers are moving to the [ARM architecture](http://en.wikipedia.org/wiki/ARM_architecture) with lighter operating systems, Microsoft has stood firm to Windows. Though Microsoft has [Windows CE](http://en.wikipedia.org/wiki/Windows_CE) for ARM support it has kept its target market for the smartphone industry with [Windows Mobile](http://en.wikipedia.org/wiki/Windows_Mobile) and the new Windows CE 6 based [Windows Phone 7](http://en.wikipedia.org/wiki/Windows_Phone_7). Some manufacturers, however, still have shown prototypes of Windows CE-based tablets running a custom shell. To date, the full Windows 7 does not yet support ARM architecture.

#### b) Linux

One early implementation of a [Linux](http://en.wikipedia.org/wiki/Linux) tablet was the [ProGear](http://en.wikipedia.org/w/index.php?title=ProGear&action=edit&redlink=1) by FrontPath. The ProGear used a Transmeta chip and a resistive digitizer. The ProGear initially came with a version of [Slackware Linux](http://en.wikipedia.org/wiki/Slackware_Linux), but could later be bought with Windows 98. Because these computers are general purpose [IBM PC compatible](http://en.wikipedia.org/wiki/IBM_PC_compatible) machines, they can run many different operating systems. However, the device is no longer for sale and FrontPath has ceased operations. It is important to note that many touch screen sub-notebook computers can run any of several Linux distributions with little customization.

[X.org](http://en.wikipedia.org/wiki/X.org) now supports screen rotation and tablet input through Wacom drivers, and handwriting recognition software from both the [Qt](http://en.wikipedia.org/wiki/Qt_%28framework%29)-based [Qtopia](http://en.wikipedia.org/wiki/Qtopia) and [GTK+](http://en.wikipedia.org/wiki/GTK%2B)-based [Internet Tablet OS](http://en.wikipedia.org/wiki/Internet_Tablet_OS) provide promising free and [open source](http://en.wikipedia.org/wiki/Open_source) systems for future development.

Open source note taking software in Linux includes applications such as [Xournal](http://en.wikipedia.org/wiki/Xournal) (which supports PDF file annotation), Gournal (a Gnome based note taking application), and the Java-based [Jarnal](http://en.wikipedia.org/wiki/Jarnal) (which supports handwriting recognition as a built-in function). Before the advent of the aforementioned software, many users had to rely on on-screen keyboards and alternative text input methods like [Dasher](http://en.wikipedia.org/wiki/Dasher). There is a stand alone handwriting recognition program available, Cell Writer, which requires users to write letters separately in a grid.

A number of Linux based OS projects are dedicated to tablet PCs. Since all these are open source, they are freely available and can be run or ported to devices that conform to the tablet PC design. [Maemo](http://en.wikipedia.org/wiki/Maemo) (rebranded MeeGo in 2010), a [Debian](http://en.wikipedia.org/wiki/Debian) Linux based graphical user environment, was developed for the Nokia [Internet Tablet](http://en.wikipedia.org/wiki/Internet_Tablet) devices (770, N800, N810 & N900). It is currently in generation 5, and has a vast array of applications available in both official and user supported repositories. TabletKiosk currently offers a hybrid digitizer touch device running openSUSE Linux. It is the first device with this feature to support Linux.

#### c) Intel and Nokia

[](http://en.wikipedia.org/wiki/File:N800_frontside2.jpg)

Figure2.1: The [Nokia N800](http://en.wikipedia.org/wiki/Nokia_N800)

Nokia entered the tablet space with the [Nokia 770](http://en.wikipedia.org/wiki/Nokia_770_Internet_Tablet) running [Maemo](http://en.wikipedia.org/wiki/Maemo), a Debian-based Linux distribution custom-made for their [Internet Tablet](http://en.wikipedia.org/wiki/Internet_Tablet) line. The product line continued with the [N900](http://en.wikipedia.org/wiki/N900) which is the first to add phone capabilities.

Intel, following the launch of the UMPC, started the [Mobile Internet Device](http://en.wikipedia.org/wiki/Mobile_Internet_Device) initiative, which took the same hardware and combined it with a Linux operating system custom-built for portable tablets. Intel co-developed the lightweight [Moblin](http://en.wikipedia.org/wiki/Moblin) operating system following the successful launch of the Atom CPU series on netbooks. Intel is also setting tablet goals for Atom, going forward from 2010.

**d) MeeGo**

[MeeGo](http://en.wikipedia.org/wiki/MeeGo) is a new Linux-based operating system developed by [Intel](http://en.wikipedia.org/wiki/Intel) and [Nokia](http://en.wikipedia.org/wiki/Nokia) that supports

Netbooks, Smartphones and Tablet PCs. In 2010, Nokia and Intel combined the Maemo and Moblin projects to form MeeGo. The first tablet using MeeGo is the [Neofonie](http://en.wikipedia.org/wiki/Neofonie) [WeTab](http://en.wikipedia.org/wiki/WeTab) launched September 2010 in Germany. The WeTab uses an extended version of the MeeGo operating system called WeTab OS. WeTab OS adds runtimes for Android and [Adobe AIR](http://en.wikipedia.org/wiki/Adobe_AIR) an provides a proprietary user interface optimized for the WeTab device.

The first MeeGo powered tablet pc is the [Neofonie](http://en.wikipedia.org/wiki/Neofonie) [WeTab](http://en.wikipedia.org/wiki/WeTab). The WeTab uses an extended version of the MeeGo operating system called WeTab OS. WeTab OS adds runtimes for [Android](http://en.wikipedia.org/wiki/Android_%28operating_system%29) and [Adobe AIR](http://en.wikipedia.org/wiki/Adobe_AIR) an provides a proprietary user interface optimized for the WeTab device.

### 2.3 Mobile operating systems

Tablets not following the personal computer tradition use operating systems in the style of those developed for [PDAs](http://en.wikipedia.org/wiki/PDA) and [smartphones](http://en.wikipedia.org/wiki/Smartphone).

#### Apple

Apple’s tablet product is the iPad, a tablet computer that mainly focuses on media consumption such as web browsing, email, photos, videos, and e-reading. A Wi-Fi only model of the tablet was released in April 2010, and a WiFi+3G model was introduced about a month later, using a no-contract data plan from [AT&T](http://en.wikipedia.org/wiki/AT%26T).

The iPad runs a version of Ios which was first created for the [iPhone](http://en.wikipedia.org/wiki/IPhone) and [iPod Touch](http://en.wikipedia.org/wiki/IPod_Touch). Unlike Windows on Tablet PCs, Ios is built for the [ARM architecture](http://en.wikipedia.org/wiki/ARM_architecture). Previous to the iPad’s launch, there were long standing rumors of an Apple tablet, though they were often about a product running [Mac OS X](http://en.wikipedia.org/wiki/Mac_OS_X) and being in line with Apple’s Macintosh computers. This became partially true when a 3rd party offered customized [Macbooks](http://en.wikipedia.org/wiki/Macbook) with pen input, known as the [Modbook](http://en.wikipedia.org/wiki/Modbook).

Previous to Apple’s commercialization of the iPad, Axiotron introduced at Macworld in 2007 an aftermarket, heavily modified Apple [MacBook](http://en.wikipedia.org/wiki/MacBook) called [Modbook](http://en.wikipedia.org/wiki/Axiotron_Modbook), a [Mac OS X](http://en.wikipedia.org/wiki/Mac_OS_X)-based tablet personal computer. The Modbook uses Apple’s [Inkwell](http://en.wikipedia.org/wiki/Inkwell_%28Macintosh%29) for handwriting and gesture recognition, and use digitization hardware from [Wacom](http://en.wikipedia.org/wiki/Wacom). To get Mac OS X to talk to the digitizer on the integrated tablet, the Modbook is supplied with a third-party driver called [TabletMagic](http://www.thinkyhead.com/tabletmagic); Wacom does not provide driver support for this device.

#### Research in Motion

The [BlackBerry PlayBook](http://en.wikipedia.org/wiki/BlackBerry_PlayBook) is a tablet computer announced in September 2010 which runs the [BlackBerry Tablet OS](http://en.wikipedia.org/wiki/BlackBerry_Tablet_OS). The OS is based on the [QNX](http://en.wikipedia.org/wiki/QNX) system that [Research in Motion](http://en.wikipedia.org/wiki/Research_in_Motion) acquired in early 2010. Delivery to developers and enterprise customers is expected in October 2010.

#### Google

Google’s linux-based Android operating system has been targeted by manufacturers for the tablet space following its success on [smartphones](http://en.wikipedia.org/wiki/Smartphones) due to its open nature and support for low-cost ARM systems much like Apple’s Ios. In 2010, there have been numerous announcements of such tablets. However, much of Android’s tablet initiative comes from manufacturers as Google primarily focuses its development on smartphones and restricts the App Market from non-phone devices. There is, moreover, talk of tablet support from Google coming to its web-centric Chrome OS. Some vendors such as Motorola and Lenovo are delaying deployment of their tablet computers until 2011, after Android is reworked to include more tablet features.

#### HP

[HP](http://en.wikipedia.org/wiki/Hewlett-Packard)’s [webOS](http://en.wikipedia.org/wiki/WebOS): Following the acquisition of [Palm, Inc.](http://en.wikipedia.org/wiki/Palm,_Inc.) By HP there have been long standing rumors of the cancellation of the Windows 7 [HP Slate](http://en.wikipedia.org/wiki/HP_Slate) in avour of one running webOS. However, recently the HP Slate was in fact confirmed by HP and appeared on the website for a short amount of time before being taken down.

[](http://en.wikipedia.org/wiki/File:Xo3-fuse-4.jpg)

Figure2.2: XO-3 concept

#### OLPC

The [OLPC](http://en.wikipedia.org/wiki/One_Laptop_per_Child) organization is developing a new version of the OLPC, strongly resembling a tablet computer, called the OLPC XO-3, running its “Sugar” operating system, based on Linux. The new XO-3 will be based on ARM technology from [Marvell](http://en.wikipedia.org/wiki/Marvell_Technology_Group).

## 2.4 Touch user interface

A key and common component among tablet computers is touch input. This allows the user to navigate easily and intuitively and type with a [virtual keyboard](http://en.wikipedia.org/wiki/Virtual_keyboard) on the screen.

A tablet presents a more [natural user interface](http://en.wikipedia.org/wiki/Natural_user_interface) to the user than a [command line interface](http://en.wikipedia.org/wiki/Command_line_interface) or the traditional mouse driven [WIMP interface](http://en.wikipedia.org/wiki/WIMP_%28computing%29). The event processing of the operating system must respond to touches rather than clicks of a keyboard or mouse, which allows integrated hand-eye operation, a natural part of the [somatosensory system](http://en.wikipedia.org/wiki/Somatosensory_system). Although the device implementation differs from more traditional PCs or laptops, tablets are disrupting the current vendor sales by weakening traditional laptop PC sales in favor of the current tablet computers. This is even more true of the "finger driven multi-touch" interface of the more recent tablet computers, which often emulate the way actual objects behave.

#### 2.5 Handwriting recognition

Because tablet personal computers normally use a stylus, they quite often implement [handwriting recognition](http://en.wikipedia.org/wiki/Handwriting_recognition), while other tablet computers with finger driven screens do not. Finger driven screens however are potentially better suited for inputting "variable width stroke based" characters, like Chinese/Japanese/Korean writing, due to their built in capability of "pressure sensing". However at the moment not much of this potential is already used, and as a result even on tablet computers Chinese users often use a (virtual) keyboard for input.

### 2.6 Touchscreen Hardware

Touchscreens are usually one of two forms:

* **Resistive**: [Resistive touchscreens](http://en.wikipedia.org/wiki/Resistive_touchscreen) are passive and can respond to any kind of pressure on the screen. They allow a high level of [precision](http://en.wikipedia.org/wiki/Precision) (which may be needed, when the touch screen tries to emulate a [mouse](http://en.wikipedia.org/wiki/Mouse_pointer#Mouse_cursor) for precision pointing, which in Tablet personal computers is common) but may require calibration to be [accurate](http://en.wikipedia.org/wiki/Accuracy). Because of the high resolution of detection, a stylus is often used for resistive screens. Although some possibility exist for implementing [multi-touch](http://en.wikipedia.org/wiki/Multi-touch) on a resistive touch-screen, the possibilities are quite limited. As modern tablet computers tend to heavily lean on the use of multi-touch, this technology has faded out and has been replaced by.
* **Capacitive**: [Capacitive touchscreens](http://en.wikipedia.org/wiki/Capacitive_sensing) tend to have better accuracy and responsive than resistive screens. Because they require a conductive material, such as a finger tip, for input, they are not common among (stylus using) Tablet PCs but are more prominent on the smaller scale "tablet computer" devices for ease of use, which generally don't use a stylus, and need multi-touch capabilities.

Other touch technology used in tablets include:

* Palm recognition. It prevents inadvertent palms or other contacts from disrupting the pen's input.
* [Multi-touch](http://en.wikipedia.org/wiki/Multi-touch) capabilities, which can recognize multiple simultaneous finger touches, allowing for enhanced manipulation of on-screen objects. Since mid-2010, new tablet computers with [mobile operating systems](http://en.wikipedia.org/wiki/Mobile_operating_system) forego the [Wintel](http://en.wikipedia.org/wiki/Wintel) paradigm, have a different interface and have created a new type of computing device.

These [mobile OS tablet computer](http://en.wikipedia.org/wiki/Mobile_operating_system) devices are normally finger driven and use [multi-touch](http://en.wikipedia.org/wiki/Multi-touch) [capacitive](http://en.wikipedia.org/wiki/Capacitive_sensing) [touch screens](http://en.wikipedia.org/wiki/Touch_screen), instead of the simple [resistive touchscreens](http://en.wikipedia.org/wiki/Resistive_touchscreen) of typical stylus driven systems. First of these was the [iPad](http://en.wikipedia.org/wiki/IPad), with others following. In foregoing the [x86](http://en.wikipedia.org/wiki/X86) precondition (a requisite of Windows compatibility), the new class of tablet computers use a version of an [ARM architecture](http://en.wikipedia.org/wiki/ARM_architecture) processor heretofore used in portable equipment (e.g., [MP3 players](http://en.wikipedia.org/wiki/Digital_audio_player) and [cell phones](http://en.wikipedia.org/wiki/Cell_phone)) now powerful enough (especially with the introduction of the [ARM Cortex family](http://en.wikipedia.org/wiki/ARM_Cortex-A9_MPCore))for tasks such as internet browsing, light production work and gaming.

Some professional-grade Tablet PCs use pressure sensitive films that additionally allows pressure sensitivity such as those on [graphics tablets](http://en.wikipedia.org/wiki/Graphics_tablet).

Concurrently capacitive touch-screens, which use finger tip detection can often detect the size of the touched area, and can make some conclusions to the pressure force used, for a similar result.

**2.7 Tablet personal computer**

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|  |
| [Tablet.jpg](http://en.wikipedia.org/wiki/File:Tablet.jpg) |
| Figure2.3: HP Compaq tablet PC with rotating/removable keyboard |

A tablet pc is portable personal computer equipped with a touchscreen as a primary input device and designed to be operated and owned by an individual. The term was made popular as a concept presented by Microsoft in 2001, but tablet pcs now refers to any tablet sized personal computer even its not using Windows but another pc operating system. Tablet may use virtual keyboards and handwriting recognition for text input through the touchscreen.

**2.8 Microsoft Windows**

All tablet personal computers have a wireless adapter for Internet and local network connection. Software applications for tablet PCs include office suites, web browsers, games and a variety of applications. However, since portable computer hardware components are low powered, demanding PC applications may not provide an ideal experience to the user.While many tablet manufacturers are moving to the [ARM architecture](http://en.wikipedia.org/wiki/ARM_architecture) with lighter operating systems, Microsoft has stood firm to Windows. Though Microsoft has [Windows CE](http://en.wikipedia.org/wiki/Windows_CE) for ARM support it has kept its target market for the smartphone industry with [Windows Mobile](http://en.wikipedia.org/wiki/Windows_Mobile) and the new Windows CE 6 based [Windows Phone 7](http://en.wikipedia.org/wiki/Windows_Phone_7). Some manufacturers, however, still have shown prototypes of Windows CE-based tablets running a custom shell.

With the succession of Windows Vista, the Tablet PC functionality no longer required a separate edition. Tablet PC support is built into all editions of Windows Vista with the exception of Home Basic and Starter editions. This extends the handwriting recognition, ink collection, and additional input methods to any computer running Vista even if the input device is an external digitizer, a touch screen, or even a regular mouse. Vista also supports multi-touch functions and gestures (originally developed for the [Microsoft Surface](http://en.wikipedia.org/wiki/Microsoft_Surface) version of Vista) and is now usable by the public with the release of multi-touch tablets. Windows Vista also significantly improved handwriting recognition functionality with the introduction a handwriting recognition personalization tool as well as an automatic handwriting learning tool.

Tablet functionality is available in all editions of Windows 7 except the Starter edition. It introduces a new Math Input Panel that recognizes handwritten math expressions and formulas, and integrates with other programs. Windows 7 also significantly improved pen input and handwriting recognition by becoming faster, more accurate, and supportive of more languages, including East Asian writing systems. Personalized custom dictionaries help with the recognition of specialized vocabulary (like medical and technical terms), and text prediction speeds up the input process to make note-taking faster. Multi-touch technology is also available on some tablet PCs, enabling more advanced interaction using touch gestures with your fingers the same way a mouse is used. Despite such advances, problems may arise with tablet functions of the OS, when, for instance, touch screen drivers are recognized as PS/2 mouse input rather than a touch input device. In such instances tablet functions may be unavailable or severely restricted in functionality.

[Windows 7](http://en.wikipedia.org/wiki/Windows_7) touch capability is built with [Microsoft Surface](http://en.wikipedia.org/wiki/Microsoft_Surface) technologies. This is a gesture and touch-centric UI enhancement that works with most current touch computers. Among the first tablet PCs launched in 2010 based on the Windows 7 operating system are bModo12 from bModoand Samsung Galaxy. Windows has a history of tablet technology including [Windows XP Tablet PC Edition](http://en.wikipedia.org/wiki/Windows_XP_Tablet_PC_Edition). Tablet PC Edition is a superset of Windows XP Professional, the difference being tablet functionality, including alternate text input ([Tablet PC Input Panel](http://en.wikipedia.org/wiki/Tablet_PC_Input_Panel)) and basic drivers for support of tablet PC specific hardware. Requirements to install Tablet PC Edition include a tablet digitizer or touchscreen device, and hardware control buttons including a [Ctrl-Alt-Delete](http://en.wikipedia.org/wiki/Control-Alt-Delete) shortcut button, scrolling buttons, and at least one user-configurable application button.

##### **2.9 Windows applications**

Applications developed for the tablet PC cater to the form factor and functionality available on the platform. Many forms of applications incorporate a pen-friendly user interface and/or the ability to hand write directly in the document or interface.

A brief description of the applications included follows:

* 1. **Experience Pack:**
* Ink Desktop: an Active Desktop control designed to run in the background and allow the user to write directly on the desktop.
* Snipping Tool: a screen capture application which allows the tablet pen to be used to select a portion of the screen and then annotate it and save as a file or send in an email.
* Ink Art: a painting application developed by Ambient Design originally as ArtRage, licensed to Microsoft for release to Tablet PC users.
* Ink Crossword: a crossword application developed to mirror the experience of a paper crossword puzzle on a tablet PC.
* Media Transfer: a synchronization utility designed to download music, pictures, and videos from computers in the same network.
  1. **Education Pack:**
* [Ink Flash Cards](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview3.mspx): an application designed to assist memorization by using a [flash card](http://en.wikipedia.org/wiki/Flash_card) approach, enabling the user to hand write their own flash cards and display them back in a slide show.
* [Equation Writer](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview4.mspx): a recognition tool specializing in converting handwritten mathematical equations to a computer-generated image for pasting into other documents.
* [GoBinder Lite](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview2.mspx): an organization and note-taking application developed by Agilix Labs.
* [Hexic Deluxe](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview6.mspx): a game with a tablet PC specific gesture enabled for easier use with the tablet and better.

## Popular models

## a) Screen size trends

Many tablet PC makers have standardized on a 12" widescreen format, with a resolution of 1280x800 pixels. The Fujitsu T5010 has a larger 13.3" display, but still runs at the 1280x800 pixel resolution. The Acer TravelMate C300 has a 14.1" screen at 1024x768.

The 12" form factor is optimal for the power, size and weight considerations required for portability. Although there is some demand for larger Tablet PC screen sizes from consumers, larger screens add significant weight and bulk to Tablet PCs. They also require more power, therefore larger, heavier batteries or shorter battery life.

For current tablet computers, (non tablet PCs) the general size is 10" (Used by the iPad) or 7" (Used by many Android tablets).

## CHAPTER: 3

## 3.1 Timeline of tablet PC history

The [Tablet computer](http://en.wikipedia.org/wiki/Tablet_computer) and the associated special operating software is an example of [Pen computing](http://en.wikipedia.org/wiki/Pen_computing) technology, and thus the development of tablets has deep historical roots.

The depth of these roots can be quite surprising to people who are only familiar with current commercial products. For example, the first patent for an electronic tablet used for handwriting was granted in 1888. The first patent for a system that recognized handwritten characters by analyzing the handwriting motion was granted in 1915. The first publicly-demonstrated system using a tablet and handwriting text recognition instead of a keyboard for working with a modern digital computer dates to 1956.

In addition to many academic and research systems, there were several companies with commercial products in the 1980s: [Pencept](http://en.wikipedia.org/wiki/Pencept), [Communications Intelligence Corporation](http://en.wikipedia.org/w/index.php?title=Communications_Intelligence_Corporation&action=edit&redlink=1), and Linux were among the best known of a crowded field. Later, [GO Corp.](http://en.wikipedia.org/wiki/GO_Corp.) brought out the [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS) operating system for a tablet PC product: one of the patents from GO corporation was the subject of recent infringement lawsuit concerning the Tablet PC operating system.

The following timeline list gives some of the highlights of this history:

* Before 1950
  + 1888: [U.S. Patent](http://en.wikipedia.org/wiki/U.S._Patent) granted to [Elisha Gray](http://en.wikipedia.org/wiki/Elisha_Gray) on electrical stylus device for capturing handwriting.
  + 1915: U.S. Patent on handwriting recognition user interface with a stylus.
  + 1942: U.S. Patent on touchscreen for handwriting input.
  + 1945: [Vannevar Bush](http://en.wikipedia.org/wiki/Vannevar_Bush) proposes the [Memex](http://en.wikipedia.org/wiki/Memex), a data archiving device including handwriting input, in an essay [As We May Think](http://en.wikipedia.org/wiki/As_We_May_Think).
* 1950s
  + Tom Dimond demonstrates the Styalator electronic tablet with pen for computer input and software for recognition of handwritten text in real-time.
* Early 1960s
  + RAND Tablet invented. The RAND Tablet is better known than the Styalator, but was invented later.
* Late 1960s
  + [Alan Kay](http://en.wikipedia.org/wiki/Alan_Kay) of [Xerox](http://en.wikipedia.org/wiki/Xerox) PARC proposed a notebook computer, optionally using pen input, called the [Dynabook](http://en.wikipedia.org/wiki/Dynabook): however the device is never constructed or implemented with pen input.
* 1966
  + In the [science fiction](http://en.wikipedia.org/wiki/Science_fiction) [television series](http://en.wikipedia.org/wiki/Television_series) [Star Trek](http://en.wikipedia.org/wiki/Star_Trek:_The_Original_Series), crew members carry large, wedge-shaped electronic [clipboards](http://en.wikipedia.org/wiki/Clipboard), operated through the use of a stylus.
* 1982
  + [Pencept](http://en.wikipedia.org/wiki/Pencept) of [Waltham, Massachusetts](http://en.wikipedia.org/wiki/Waltham,_Massachusetts) markets a general-purpose computer terminal using a tablet and handwriting recognition instead of a keyboard and mouse.
  + Cadre System markets the Inforite point-of-sale terminal using handwriting recognition and a small electronic tablet and pen.
* 1985
  + [Pencept](http://en.wikipedia.org/wiki/Pencept) and CIC both offer PC computers for the consumer market using a tablet and handwriting recognition instead of a keyboard and mouse. Operating system is [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS).
* 1989
  + The first commercially available tablet-type portable computer was the [GRiDPad](http://en.wikipedia.org/wiki/GRiDPad) from [GRiD Systems](http://en.wikipedia.org/wiki/GRiD_Systems), released in September. Its operating system was based on [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS).
  + Wang Laboratories introduces Freestyle. Freestyle was an application that would do a screen capture from an MS-DOS application, and let the user add voice and handwriting annotations. It was a sophisticated predecessor to later note-taking applications for systems like the Tablet PC. The operating system was [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS)
  + In partnership with [Fujitsu](http://solutions.us.fujitsu.com/www/content/products/Tablet-PCS/index.php), the Poqet Computer Corporation announced the arrival of the Poqet PC.
* 1991
  + The Momenta Pentop was released.
  + [GO Corporation](http://en.wikipedia.org/wiki/GO_Corp.) announced a dedicated operating system, called [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS), featuring control of the operating system desktop via handwritten gesture shapes. Gestures included "flick" gestures in different directions, check-marks, cross-outs, pig-tails, and circular shapes, among others.
  + NCR released model 3125 pen computer running MS-DOS, [Penpoint OS](http://en.wikipedia.org/wiki/Penpoint_OS) or [Pen Windows](http://en.wikipedia.org/wiki/Pen_Windows).
  + The [Apple Newton](http://en.wikipedia.org/wiki/Apple_Newton) entered development; although it ultimately became a [PDA](http://en.wikipedia.org/wiki/Personal_Digital_Assistant), its original concept (which called for a larger screen and greater sketching capabilities) resembled the hardware of a Tablet PC.
* 1992
  + [GO Corporation](http://en.wikipedia.org/wiki/GO_Corporation) shipped the [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS) for general availability and IBM announced IBM 2125 pen computer (the first IBM model named "ThinkPad") in April.
  + [Microsoft](http://en.wikipedia.org/wiki/Microsoft) releases [Windows for Pen Computing](http://en.wikipedia.org/wiki/Windows_for_Pen_Computing) as a response to the [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS) by [GO Corporation](http://en.wikipedia.org/wiki/GO_Corporation).
* 1993
  + [Fujitsu](http://en.wikipedia.org/wiki/Fujitsu) releases the Poqet PC the first pen tablet to use an integrated wireless LAN
  + Apple Computer announces the Newton PDA, also known as the Apple MessagePad, which includes handwriting recognition with a stylus.
  + The [IBM](http://en.wikipedia.org/wiki/IBM) releases the [ThinkPad](http://en.wikipedia.org/wiki/ThinkPad), IBM's first commercialized portable tablet computer product available to the consumer market, as the IBM [ThinkPad](http://en.wikipedia.org/wiki/ThinkPad) 750P and 360P
  + [AT&T](http://en.wikipedia.org/wiki/AT%26T) introduced the [EO Personal Communicator](http://en.wikipedia.org/wiki/EO_Personal_Communicator) combining PenPoint with wireless communications.
  + BellSouth released the [IBM Simon](http://en.wikipedia.org/wiki/IBM_Simon) Personal Communicator, an analog cellphone using a touch-screen and display. It did not include handwriting recognition, but did permit users to write messages and send them as faxes on the analog cellphone network, and included PDA and Email features.
* 1999
  + The "QBE" pen computer created by Aqcess Technologies wins [Comdex](http://en.wikipedia.org/wiki/Comdex) Best of Show.
* 2000
  + [PaceBlade](http://www.paceblade.com/) develops the first device that meets the Microsoft's Tablet PC standard and received the "Best Hardware" award at VAR Vision 2000
  + The "QBE Vivo" pen computer created by Aqcess Technologies ties for [Comdex](http://en.wikipedia.org/wiki/Comdex) Best of Show.
* 2001
  + [Bill Gates](http://en.wikipedia.org/wiki/Bill_Gates) of Microsoft demonstrates the first public prototype of a Tablet PC (defined by Microsoft as a pen-enabled computer conforming to hardware specifications devised by Microsoft and running a licensed copy of the "Windows XP Tablet PC Edition" operating system) at [Comdex](http://en.wikipedia.org/wiki/Comdex).
* 2003
  + [PaceBlade](http://www.paceblade.com/) receives the "Innovation des Jahres 2002/2003" award for the [PaceBook](http://www.paceblade.com/site/DesktopDefault.aspx?tabindex=1&tabid=220&Cat=30&grp=3010&ar=3&Prod_ID=25&Prod=PB_D110) Tablet PC from PC Professionell Magazine at the [Cebit.](http://en.wikipedia.org/wiki/Cebit)
  + Fingerworks develops the touch technology and touch gestures later used in the Apple [iPhone](http://en.wikipedia.org/wiki/IPhone).
* 2006
  + Samsung introduces the [Samsung Q1](http://en.wikipedia.org/wiki/Samsung_Q1) UMPC.
  + [Windows Vista](http://en.wikipedia.org/wiki/Windows_Vista) released for general availability. Vista included the functionality of the special Tablet PC edition of [Windows XP](http://en.wikipedia.org/wiki/Windows_XP).
  + On Disney Channel Original Movie, Read It and Weep, Jamie uses a Tablet PC for her journal.
* 2007
  + Axiotron introduces Modbook, the first (and only) tablet computer based on Mac hardware and Mac OS X at Macworld.
* 2008
  + In April 2008, as part of a larger federal court case, the gesture features of the Windows/Tablet PC operating system and hardware were found to infringe on a patent by [GO Corp.](http://en.wikipedia.org/wiki/GO_Corp.) concerning user interfaces for pen computer operating systems. Microsoft's acquisition of the technology is the subject of a separate lawsuit.
  + [HP](http://en.wikipedia.org/wiki/HP) releases the second Multi-Touch capable tablet: the [HP TouchSmart](http://en.wikipedia.org/wiki/HP_TouchSmart) tx2 series.
* 2009
  + Asus announces a tablet netbook, the [EEE PC](http://en.wikipedia.org/wiki/EEE_PC) T91 and T91MT, the latter which features a [multi-touch](http://en.wikipedia.org/wiki/Multi-touch) screen.
  + Always Innovating announced a new tablet netbook with an ARM CPU.
  + [Motion Computing](http://en.wikipedia.org/wiki/Motion_Computing) launched the J3400.
* 2010
  + [MobileDemand](http://www.ruggedtabletpc.com/) launches the [xTablet T7000 Rugged Tablet PC](http://www.ruggedtabletpc.com/rugged-tablet-pc/xtablet-t7000-rugged-tablet-pc.php) which runs a full Windows OS and features include an integrated numeric keypad, bar code scanner, credit card reader, etc.
  + Apple unveils the [iPad](http://en.wikipedia.org/wiki/IPad), running [Apple iOS](http://en.wikipedia.org/wiki/Apple_iOS).
  + [Quaduro Systems](http://www.quaduro.com/) unveils the 10" [QuadPad 3G Plus](http://www.quaduro.com/en/gb/products/src.php?id=7), the first 900 gram Microsoft Windows based 3G tablet PC with 8 hours battery life.
  + Samsung unveils the [Galaxy Tab](http://en.wikipedia.org/wiki/Galaxy_Tab), running [Google Android](http://en.wikipedia.org/wiki/Google_Android).
  + [bModo](http://www.bmodo.com/) launches the [bModo12](http://bmodo.com/bmodo12.html/) which runs the Windows 7 OS and features include 11.6" TFT-LCD display, 3G, Wi-Fi, GPS, Bluetooth® 2.1, USB2.0, SDHC slot, unlocked SIM card Slot, miniHDMI connector, OMTP Jack, a webcam, a mic, etc.
  + Neofonie releases the [WeTab](http://en.wikipedia.org/wiki/WeTab), a [MeeGo](http://en.wikipedia.org/wiki/MeeGo)-based slate tablet PC, featuring an 11.6 inch multi-touch screen at 1366×768 pixels resolution.
  + [Dixons Retail plc](http://en.wikipedia.org/wiki/Dixons_Retail_plc) unveils the [Advent Vega](http://en.wikipedia.org/wiki/Advent_Vega), a 10" tablet PC running Android 2.2, having a 1 GHz NVIDIA Tegra chipset, 512 Mb of RAM and ROM, 1.3 MP camera, Wi-Fi b/g connectivity, Bluetooth 2.1, a micro SD card slot, a USB port and a 16h battery life for audio playback and 6.5h for 1080p video.
  + Dell Announces the Inspiron Duo A flip screen Netbook and Tablet PC hybrid
  + [HP](http://en.wikipedia.org/wiki/HP) releases the Slate 500, running a full-version of Windows 7.

**CHAPTER: 4**

**4.1 IntraText**

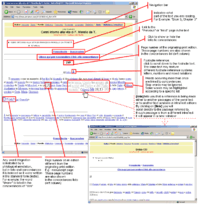
[](http://en.wikipedia.org/wiki/File:IntraText_Text_Page.GIF)

Figure4.1: IntraText Text page

IntraText is a [digital library](http://en.wikipedia.org/wiki/Digital_library) that offers an interface while meeting formal requirements. Texts are displayed in a hypertextual way, based on a [Tablet PC](http://en.wikipedia.org/wiki/Tablet_PC) interface. By linking words in the text, it provides [Concordances](http://en.wikipedia.org/wiki/Concordance_%28publishing%29), [word lists](http://en.wikipedia.org/wiki/Word_lists), statistics and links to cited works. Most content is available under a [Creative Commons license](http://en.wikipedia.org/wiki/Creative_Commons_licenses)[[1]](http://creativecommons.org/licenses/by-nc-sa/3.0/). It also offers publishing services that enable similar advantages.

The IntraText interface applies a [cognitive ergonomics](http://en.wikipedia.org/wiki/Cognitive_ergonomics) model based on lexical [hypertext](http://en.wikipedia.org/wiki/Hypertext) and on the Tablet PC or [touch screen](http://en.wikipedia.org/wiki/Touch_screen) interface. It uses a set of tools and methods based on [HLT](http://en.wikipedia.org/wiki/Human_language_technology) (Human Language Technologies).

**4.1.1 Use**

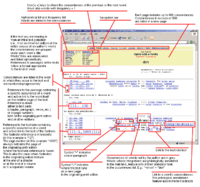
[](http://en.wikipedia.org/wiki/File:IntraText_Concordances.GIF)

Figure4.2: IntraText Concordances

IntraText is a reading, reference and search tool. It can be used to read a work, to browse a text as hypertext, to search for words and phrases just through a simple click of your pen or mouse.

The Tablet PC interface allows to browse and search without keyborad, just using the mouse of the computer or the pen to touch screen of the Tablet PC. The [ease of use](http://en.wikipedia.org/wiki/Ease_of_use) and [accessibility](http://en.wikipedia.org/wiki/Accessibility) of IntraText are some of the most appreciated features.

**4.2 Publishing**

IntraText is structured to create and make available high quality electronic editions, particularly in editorial, philological and linguistics aspects. IntraText editions can be published on the [Internet](http://en.wikipedia.org/wiki/Internet), [intranets](http://en.wikipedia.org/wiki/Intranet) or distributed on [CD-ROM](http://en.wikipedia.org/wiki/CD-ROM) in several ways.

IntraText allows to reproduce faithfully the scholarly editions: footnotes (even when structured in several apparatuses), philological annotations, references to one or more different editions, distinction between the author's lexicon and the lexicon of other authors, several languages in the same text, etc.

Finally, IntraText allows intra- and extra-textual links to citations. Extra-textual citations are automatically linked when the cited work is available in IntraText edition.

IntraText allows to create text collections as a whole hypertext, for example the collected works of an author, corpora, etc. The IntraText collection creates a browsing system which preserves the identity of each collected text (author, title, structure, criteria for concordance reference) but unifies them through the concordances. In an IntraText collection, the [Table of contents](http://en.wikipedia.org/wiki/Table_of_contents) has two levels: the index of the works and, for each work, its own TOC.

**4.3 Editorial procedures**

The system that generates IntraText checks the text for several issues, according to a schema conceived to improve content quality and representation quality. In particular:

* **lexical control**: the system displays words not matching a reference [vocabulary](http://en.wikipedia.org/wiki/Vocabulary) and creates a specific check list.
* **footnote control**: if the text has footnotes, the system verifies the correspondence between footnotes and references and creates a detailed report. This feature has been included as many IntraTexts have thousands of footnotes.
* **multimedia element control (e.g. pictures)**: if the text has multimedia elements, the system checks whether each multimedia element file is available and generates a detailed report.
* **references control**: if a text links to other parts of the same text or links to other texts available in IntraText edition, the system checks the coordinates of each quotation (e.g.: "Mt I, 28"), listing them in a check list.

# CHAPTER: 5

# 5.1 Microsoft Tablet PC

[](http://en.wikipedia.org/wiki/File:Tablet.jpg)

Figure5.1: HP Compaq tablet PC with rotating/removable keyboard

A Microsoft Tablet PC is a term coined by Microsoft for tablet computers conforming to a set of specifications announced in 2001 by Microsoft, for a pen-enabled [personal computer](http://en.wikipedia.org/wiki/Personal_computer), conforming to hardware specifications devised by Microsoft and running a licensed copy of "Windows XP Tablet PC Edition" operating system or a derivative thereof.

Hundreds of such [Tablet PCs](http://en.wikipedia.org/wiki/Tablet_PC) have come onto the market since then.

## 5.2 History

In 2002, [original equipment manufacturers](http://en.wikipedia.org/wiki/Original_equipment_manufacturer)' released the first tablet PCs designed to the Microsoft Tablet PC specification. This generation of Microsoft Tablet PCs were designed to run [Windows XP Tablet PC Edition](http://en.wikipedia.org/wiki/Windows_XP_Tablet_PC_Edition), the Tablet PC version of [Windows XP](http://en.wikipedia.org/wiki/Windows_XP). This version of [Microsoft Windows](http://en.wikipedia.org/wiki/Microsoft_Windows) superseded Microsoft's earlier [pen computing](http://en.wikipedia.org/wiki/Pen_computing) operating environment, [Windows for Pen Computing 2.0](http://en.wikipedia.org/wiki/Windows_for_Pen_Computing). After releasing Windows XP Tablet PC Edition, Microsoft designed the successive [desktop computer](http://en.wikipedia.org/wiki/Desktop_computer) versions of Windows, [Windows Vista](http://en.wikipedia.org/wiki/Windows_Vista) and [Windows 7](http://en.wikipedia.org/wiki/Windows_7), to support pen computing intrinsically.

## 5.3 Form variations of Tablet PC's

### a) Booklets

Booklet PCs are dual screen tablet computers that fold like a book. Typical booklet PCs are equipped with [multi-touch](http://en.wikipedia.org/wiki/Multi-touch) screens and pen writing recognition capabilities. They are designed to be used as digital [day planners](http://en.wikipedia.org/wiki/Day_planner), internet surfing devices, project planners, music players, and displays for video, live TV, and e-reading.

### b) Slates

Slate computers, which resemble [writing slates](http://en.wikipedia.org/wiki/Slate_%28writing%29), are tablet PCs without a dedicated keyboard. For text input, users rely on handwriting recognition via an active digitizer, touching an on-screen keyboard using fingertips or a [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29), or using an external keyboard that can usually be attached via a [wireless](http://en.wikipedia.org/wiki/Wireless) or [USB](http://en.wikipedia.org/wiki/USB) connection.

Tablet PCs typically incorporate small (8.4–14.1 inches/21–36 centimetres) [LCD](http://en.wikipedia.org/wiki/LCD) screens and have been popular in [vertical markets](http://en.wikipedia.org/wiki/Vertical_market) such as health care, education, hospitality and field work. Applications for field work often require a tablet PC that has rugged specifications that ensure long life by resisting heat, humidity, and drop/vibration damage. This added focus on mobility and/or ruggedness often leads to elimination of moving parts that could hinder these qualities.

### Convertibles

[](http://en.wikipedia.org/wiki/File:Lenovo-X61-Tablet-Mode.jpg)

Figure5.2: A [Lenovo](http://en.wikipedia.org/wiki/Lenovo) X61 in slate mode

Convertible notebooks have a base body with an attached keyboard. They more closely resemble modern laptops, and are usually heavier and larger than slates.

Typically, the base of a convertible attaches to the display at a single joint called a swivel hinge or rotating hinge. The joint allows the screen to rotate through 180° and fold down on top of the keyboard to provide a flat writing surface. This design, although the most common, creates a physical point of weakness on the notebook.

Some manufacturers have attempted to overcome these weak points. The [Panasonic Toughbook](http://en.wikipedia.org/wiki/Panasonic_Toughbook) 19, for example, is advertised as a more durable convertible notebook. One model by [Acer](http://en.wikipedia.org/wiki/Acer_%28company%29) (the TravelMate C210) has a sliding design in which the screen slides up from the slate-like position and locks into place to provide the laptop mode.

Convertibles are by far the most popular form factor of tablet PCs, because they still offer the keyboard and pointing device (usually a trackpad) of older notebooks, for users who do not use the touchscreen display as the primary method of input.

### d) Hybrids

Hybrids, coined by users of the [HP/Compaq TC1000](http://en.wikipedia.org/wiki/HP/Compaq_TC1000) and [TC1100](http://en.wikipedia.org/wiki/TC1100) series, share the features of the slate and convertible by using a detachable keyboard that operates in a similar fashion to a convertible when attached. Hybrids are not to be confused with slate models with detachable keyboards; detachable keyboards for pure slate models do not rotate to allow the tablet to rest on it like a convertible.

**5.4 Two Factors when Comparing Tablet PCs and Laptops**

The ideal personal computer would have the power of a super computer and the portability of a wristwatch. Unfortunately, such a computer can be found only on Star Trek reruns, so all of us in the real world must make some choices. Your choices will probably be based on what you require in the following two categories:

|  |  |
| --- | --- |
| • | **Performance and features:** Refers to the GHz of processor speed, pixels of screen area, megabytes of memory, type and number of drives (such as a DVD drive), and other characteristics. |
| • | **Range of use:** Refers to the mobility of a Tablet PC or laptop and how it extends the way you use it. |

Laptops can rival all but the higher-end desktops in performance and features. Plus laptops can be easily carried to convenient locations or on trips. Tablet PCs offer the best combination of performance and range of use, but they can't offer everything to everybody. Let's look at how Chris and Frank evaluated their needs in these two categories.

## 5.5 System software

[Windows 7](http://en.wikipedia.org/wiki/Windows_7) touch capability is similar to [Microsoft Surface](http://en.wikipedia.org/wiki/Microsoft_Surface) technologies. This is a gesture and touch-centric UI enhancement that works with most current touch computers. Windows has a history of tablet technology including [Windows XP Tablet PC Edition](http://en.wikipedia.org/wiki/Windows_XP_Tablet_PC_Edition). Tablet PC Edition is a superset of Windows XP Professional, the difference being tablet functionality, including alternate text input ([Tablet PC Input Panel](http://en.wikipedia.org/wiki/Tablet_PC_Input_Panel)) and basic drivers for support of tablet PC specific hardware. Requirements to install Tablet PC Edition include a tablet digitizer or touchscreen device, and hardware control buttons including a [Ctrl-Alt-Delete](http://en.wikipedia.org/wiki/Control-Alt-Delete) shortcut button, scrolling buttons, and at least one user-configurable application button.

A few select high schools in the US use tablet PCs for every student.

Service Pack 2 for Windows XP includes Tablet PC Edition 2005 and is a free upgrade. This version brought improved handwriting recognition and improved the Input Panel, allowing it to be used in almost every application. The Input Panel was also revised to extend speech recognition services (input and correction) to other applications.

With the succession of Windows Vista, the Tablet PC functionality no longer required a separate edition. Tablet PC support is built into all editions of Windows Vista with the exception of Home Basic and Starter editions. This extends the handwriting recognition, ink collection, and additional input methods to any computer running Vista even if the input device is an external digitizer, a touch screen, or even a regular mouse. Vista also supports Multi-Touch functions and gestures (originally developed for the [Microsoft Surface](http://en.wikipedia.org/wiki/Microsoft_Surface) version of Vista) and is now usable by the public with the release of Multi-Touch tablets. Windows Vista also significantly improved handwriting recognition functionality with the introduction a handwriting recognition personalization tool as well as an automatic handwriting learning tool.

Tablet functionality is available in all editions of Windows 7 except the Starter edition. It introduces a new Math Input Panel that recognizes handwritten math expressions and formulas, and integrates with other programs. Windows 7 also significantly improved pen input and handwriting recognition by becoming faster, more accurate, and supportive of more languages, including East Asian writing systems. Personalized custom dictionaries help with the recognition of specialized vocabulary (like medical and technical terms), and text prediction speeds up the input process to make note-taking faster. Multi-Touch technology is also available on some Tablet PCs, enabling more advanced interaction using touch gestures with your fingers the same way a mouse is used. Despite such advances, problems may arise with tablet functions of the OS, when, for instance, touch screen drivers are recognized as PS/2 mouse input rather than a touch input device. In such instances tablet functions may be unavailable or severely restricted in functionality.

## 5.6 Windows applications

Applications developed for the tablet PC cater to the form factor and functionality available on the platform. Many forms of applications incorporate a pen-friendly user interface and/or the ability to hand write directly in the document or interface.

A brief description of the applications included follows:

* **Experience Pack**
* Ink Desktop: an Active Desktop control designed to run in the background and allow the user to write directly on the desktop.
* Snipping Tool: a screen capture application which allows the tablet pen to be used to select a portion of the screen and then annotate it and save as a file or send in an email.
* Ink Art: a painting application developed by Ambient Design originally as ArtRage, licensed to Microsoft for release to Tablet PC users.
* Ink Crossword: a crossword application developed to mirror the experience of a paper crossword puzzle on a tablet PC.
* Media Transfer: a synchronization utility designed to download music, pictures, and videos from computers in the same network.
* **Education Pack**
* [Ink Flash Cards](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview3.mspx): an application designed to assist memorization by using a [flash card](http://en.wikipedia.org/wiki/Flash_card) approach, enabling the user to hand write their own flash cards and display them back in a slide show.
* [Equation Writer](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview4.mspx): a recognition tool specializing in converting handwritten mathematical equations to a computer-generated image for pasting into other documents.
* [GoBinder Lite](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview2.mspx): an organization and note-taking application developed by Agilix Labs.
* [Hexic Deluxe](http://www.microsoft.com/windowsxp/downloads/tabletpc/educationpack/overview6.mspx): a game with a tablet PC specific gesture enabled for easier use with the tablet and better.
* **Touch Pack**

The [Touch Pack](http://windows.microsoft.com/en-us/windows7/whats-the-microsoft-touch-pack-for-windows-7) for Windows 7 is a free package of games and programs optimized for touch input.

* [Microsoft Blackboard](http://windows.microsoft.com/en-US/windows7/touch-pack-how-to-play-microsoft-blackboard)
* [Microsoft Garden Pond](http://windows.microsoft.com/en-US/windows7/touch-pack-how-to-play-microsoft-garden-pond)
* [Microsoft Rebound](http://windows.microsoft.com/en-US/windows7/touch-pack-how-to-play-microsoft-rebound)
* [Microsoft Surface Globe](http://www.microsoft.com/surface/en/US/touch-pack/touch-pack-globe.aspx)
* [Microsoft Surface Collage](http://www.microsoft.com/surface/en/US/touch-pack/touch-pack-collage.aspx)
* [Microsoft Surface Lagoon](http://www.microsoft.com/surface/en/US/touch-pack/touch-pack-lagoon.aspx)

## 5.7 Tablet PC's vs. traditional notebooks

The advantages and disadvantages of tablet PCs are highly subjective measures. What appeals to one user may be exactly what disappoints another. The following are commonly cited opinions of the tablet PC platform:

#### Advantages

* Usage in environments not conducive to a keyboard and mouse such as lying in bed, standing, or handling with a single hand.
* Lighter weight, lower power models can function similarly to dedicated reading devices like the [Amazon Kindle](http://en.wikipedia.org/wiki/Amazon_Kindle).
* Touch environment makes navigation easier than conventional use of keyboard and mouse or touch pad in certain contexts such as image manipulation, or mouse oriented games.
* Digital painting and image editing is enhanced and more realistic than painting or sketching with a mouse.
* The ability for easier or faster entering of diagrams, mathematical notations, and symbols.
* Allows, with the proper software, universal input, independent from different keyboard localizations.
* Some users find it more natural and fun to use a stylus to click on objects rather than a mouse or touchpad, which are not directly connected to the pointer on screen.

#### Disadvantages

* Higher cost — convertible tablet PCs can cost significantly more than their non-tablet counterparts although this premium has been predicted to fall.
* Input speed — handwriting can be significantly slower than typing speeds, the latter of which can be as high as 50-150 [WPM](http://en.wikipedia.org/wiki/WPM); however, [Slideit](http://en.wikipedia.org/wiki/Slideit), [Swype](http://en.wikipedia.org/wiki/Swype) and other technologies are able to provide alternate, speedier methods of input.
* Screen and hinge damage risk - Tablet PCs are handled more than conventional laptops, yet are built on similar frames; in addition, since their screens also serve as input devices, they run a higher risk of screen damage due to impacts and misuse. A convertible tablet PC's screen hinge is often required to rotate around two axes, unlike a normal laptop screen, subsequently increasing the number of possible mechanical and electrical (digitizer and video cables, embedded Wi-Fi antennas, etc.) failure points.
* Ergonomics - a tablet PC does not provide room for a wrist rest while the screen is folded into slate mode. In addition, the user will need to move their arm constantly while writing.
* Weaker video capabilities - Most tablet PCs are equipped with embedded graphics processors instead of discrete graphics cards. In July 2010, the only tablet PC with a discrete graphics card was the [HP TouchSmart](http://en.wikipedia.org/wiki/HP_TouchSmart) tm2t, which has the [ATI](http://en.wikipedia.org/wiki/ATI) [Mobility Radeon](http://en.wikipedia.org/wiki/Mobility_Radeon) HD5450 as an optional extra.

## 5.8 Features

In addition to the host of features found on regular laptops, tablet PCs may also possess:

* Capacitive contact technology, which can sense finger(s) on the screen without requiring significant pressure for system to recognize an input.
* Palm recognition, which prevent inadvertent palms or other contacts from disrupting the pen's input.
* [Multi-touch](http://en.wikipedia.org/wiki/Multi-touch) capabilities, which can recognize multiple simultaneous finger touches, allowing for enhanced manipulation of on-screen objects.

## 5.9 Popular models

Most of the major PC manufacturers also make tablet PCs which run Microsoft Windows. These include [Acer](http://en.wikipedia.org/wiki/Acer_%28company%29), [Hewlett-Packard](http://en.wikipedia.org/wiki/Hewlett-Packard), [Lenovo Group](http://en.wikipedia.org/wiki/Lenovo_Group) and [Toshiba](http://en.wikipedia.org/wiki/Toshiba).

## 5.10 Application software

* [Comfort On-Screen Keyboard](http://www.comfort-software.com/on-screen-keyboard.html) - advanced on-screen keyboard for Tablet PC
* [Microsoft Windows Journal](http://en.wikipedia.org/wiki/Windows_Journal)
* [Microsoft Office OneNote](http://en.wikipedia.org/wiki/Microsoft_Office_OneNote)
* [Einstein Technologies Tablet Enhancements for Outlook](http://en.wikipedia.org/w/index.php?title=Einstein_Technologies_Tablet_Enhancements_for_Outlook&action=edit&redlink=1)
* FutureWave Smartsketch drawing program published by [FutureWave Software](http://en.wikipedia.org/wiki/FutureWave_Software)
* [GO Corporation](http://en.wikipedia.org/wiki/GO_Corporation)
* [Agilix GoBinder](http://en.wikipedia.org/wiki/Agilix_GoBinder)
* [Mobilis - Protectis Range](http://en.wikipedia.org/w/index.php?title=Mobilis&action=edit&redlink=1)
* [EverNote](http://en.wikipedia.org/wiki/EverNote)
* [InkSeine](http://research.microsoft.com/en-us/um/redmond/projects/inkseine/): Prototype Tablet GUI/Interface - Microsoft Research
* [IHMC CmapTools](http://cmap.ihmc.us/conceptmap.html) - a free [concept mapping](http://en.wikipedia.org/wiki/Concept_mapping) application
* [Xournal](http://en.wikipedia.org/wiki/Xournal) - a linux notetaking application
* OnSite Companion Construction Software for Tablet PC
* [MusicPad Pro](http://users.erols.com/rwservices/pens/biblio10.html#FreehandSystems06): MusicReader - Electronic Music Stand - sheet music display on Tablet PC
* [Documentor](http://www.eonsystems.net/documentor.htm): A Documentation Engine for Health Care Professionals
* [StarDraw](http://en.wikipedia.org/wiki/StarDraw) Contol - [Room automation](http://en.wikipedia.org/wiki/Room_automation) / [Home cinema](http://en.wikipedia.org/wiki/Home_cinema) control system

## 5.11 Screen size trends

Many Tablet PC makers have standardized on a 12" widescreen format, with a resolution of 1280x800 pixels. The Fujitsu T5010 has a larger 13.3" display, but still runs at the 1280x800 pixel resolution. The Acer Travel Mate C300 has a 14.1" screen at 1024x768.

The 12" form factor is optimal for the power, size and weight considerations required for portability.] Although there is some demand for larger Tablet PC screen sizes from consumers, larger screens add significant weight and bulk to Tablet PCs. They also require more power, therefore larger, heavier batteries or shorter battery life.

# CHAPTER: 6

# 6.1 PEN COMPUTING

Pen computing refers to a computer user-interface using a pen (or [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29)) and tablet, rather than devices such as a keyboard and a mouse.

Pen computing is also used to refer to the usage of [mobile devices](http://en.wikipedia.org/wiki/Mobile_device) such as [wireless](http://en.wikipedia.org/wiki/Wireless) [tablet PCs](http://en.wikipedia.org/wiki/Tablet_PC), [PDAs](http://en.wikipedia.org/wiki/Personal_digital_assistant) and [GPS receivers](http://en.wikipedia.org/wiki/GPS_receiver). The term has been used to refer to the usage of any product allowing for mobile communication. An indication of such a device is a [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29), generally used to press upon a [graphics tablet](http://en.wikipedia.org/wiki/Graphics_tablet) or [touchscreen](http://en.wikipedia.org/wiki/Touchscreen), as opposed to using a more traditional interface such as a [keyboard](http://en.wikipedia.org/wiki/Computer_keyboard), [keypad](http://en.wikipedia.org/wiki/Keypad), [mouse](http://en.wikipedia.org/wiki/Mouse_%28computing%29) or [touchpad](http://en.wikipedia.org/wiki/Touchpad).

Historically, pen computing (defined as a computer system employing a user-interface using a pointing device plus handwriting recognition as the primary means for interactive user input) predates the use of a mouse and graphical display by at least two decades, starting with the Stylator and RAND tablet systems of the 1950s and early 1960s.

## 6.2 General techniques of pen computing

User interfaces for pen computing can be implemented in several ways. Actual systems generally employ a combination of these techniques.

### Pointing/Locator input

The tablet and [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29) are used as pointing devices, such as to replace a mouse. Note that a mouse is a relative pointing device—one uses the mouse to "push the cursor around" on a screen. However, a tablet is an absolute pointing device—one must put the stylus is exactly where the cursor goes.

There are a number of human factors considerations when actually substituting a stylus and tablet for a mouse. For example, it is much harder to target or tap the same exact position twice with a stylus, so "double-tap" operations with a stylus are harder to perform if the system is expecting "double-click" input from a mouse.

Note that a finger can be used as the stylus on a touch-sensitive tablet surface, such as with a [touchscreen](http://en.wikipedia.org/wiki/Touchscreen).

### 6.2.2 Handwriting recognition

The tablet and [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29) can be used to replace a keyboard, or both a mouse and a keyboard, by using the tablet and stylus in two modes:

* Pointing mode: The stylus is used as a pointing device as above.
* On-line Handwriting recognition mode: The strokes made with the stylus are analyzed as a "electronic ink", by software which recognizes the shapes of the strokes or marks as handwritten characters. The characters are then input as text, as if from a keyboard.

Different systems switch between the modes (pointing vs. handwriting recognition) by different means, e.g.

* By writing in separate areas of the tablet for pointing mode and for handwriting-recognition mode.
* By pressing a special button on the side of the stylus to change modes.
* By context, such as treating any marks not recognized as text as pointing input.
* By recognizing a special gesture mark.

The term "on-line handwriting recognition" is used to distinguish recognition of handwriting using a real-time [digitizing tablet](http://en.wikipedia.org/wiki/Digitizing_tablet) for input, as contrasted to "off-line handwriting recognition", which is [optical character recognition](http://en.wikipedia.org/wiki/Optical_character_recognition) of static handwritten symbols from paper.

### 6.2.3 Direct manipulation

The [stylus](http://en.wikipedia.org/wiki/Stylus_%28computing%29) is used to touch, press, and drag on simulated objects directly. See the special Wiki article on [Direct manipulation](http://en.wikipedia.org/wiki/Direct_manipulation). The Wang Freestyle system is one example. Freestyle worked entirely by direct manipulation, with the addition of electronic "ink" for adding handwritten notes.

### 6.2.4 Gesture recognition

This is the technique of recognizing certain special shapes not as handwriting input, but as an indicator of a special command.

For example, a "pig-tail" shape (used often as a proofreader's mark) would indicate a "delete" operation. Depending on the implementation, what is deleted might be the object or text where the mark was made, or the stylus can be used as a pointing device to select what it is that should be deleted.

Recent systems have used digitizers which can recognize more than one "stylus" (usually a finger) at a time, and make use of [Multi-touch](http://en.wikipedia.org/wiki/Multi-touch) gestures.

The [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS) was a special operating system which incorporated gesture recognition and handwriting input at all levels of the operating system. Prior systems which employed gesture recognition only did so within special applications, such as CAD/CAM applications or text processing.

## 6.3 History

Pen computing has very deep historical roots. The depth of these roots can be quite surprising to people who are only familiar with current commercial products. For example, the first patent for an electronic tablet used for handwriting was granted in 1888. What is probably the first patent for a system that recognized handwritten characters by analyzing the handwriting motion was granted in 1915.The first publicly-demonstrated system using a tablet and handwriting text recognition instead of a keyboard for working with a modern digital computer dates to 1956.

In addition to many academic and research systems, there were several companies with commercial products in the 1980s: [Pencept](http://en.wikipedia.org/wiki/Pencept), [Communications Intelligence Corporation](http://en.wikipedia.org/w/index.php?title=Communications_Intelligence_Corporation&action=edit&redlink=1), and Linus were among the best known of a crowded field. Later, [GO Corp.](http://en.wikipedia.org/wiki/GO_Corp.) brought out the [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS) operating system for a tablet PC product: one of the patents from GO corporation was the subject of recent infringement lawsuit concerning the Tablet PC operating system.

The following timeline list gives some of the highlights of this history:

* Before 1950
  + 1888: U.S. Patent granted to [Elisha Gray](http://en.wikipedia.org/wiki/Elisha_Gray) on electrical stylus device for capturing handwriting.
  + 1915: U.S. Patent on handwriting recognition user interface with a stylus.
  + 1942: U.S. Patent on touchscreen for handwriting input.
  + 1945: [Vannevar Bush](http://en.wikipedia.org/wiki/Vannevar_Bush) proposes the [Memex](http://en.wikipedia.org/wiki/Memex), a data archiving device including handwriting input, in an essay [As We May Think](http://en.wikipedia.org/wiki/As_We_May_Think).
* 1950s
  + Tom Dimond demonstrates the Styalator electronic tablet with pen for computer input and handwriting recognition.
* Early 1960s
  + RAND Tablet invented.
* Late 1960s
  + [Alan Kay](http://en.wikipedia.org/wiki/Alan_Kay) of Xerox PARC proposed a notebook using pen input called [Dynabook](http://en.wikipedia.org/wiki/Dynabook): however device is never constructed.
* 1982
  + [Pencept](http://en.wikipedia.org/wiki/Pencept) of Waltham, Massachusetts markets a general-purpose computer terminal using a tablet and handwriting recognition instead of a keyboard and mouse.
  + Cadre System markets the Inforite point-of-sale terminal using handwriting recognition and a small electronic tablet and pen.
* 1985:
  + [Pencept](http://en.wikipedia.org/wiki/Pencept) and CIC both offer PC computers for the consumer market using a tablet and handwriting recognition instead of a keyboard and mouse. Operating system is [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS).
* 1989
  + The first commercially available tablet-type portable computer was the GRiDPad from [GRiD Systems](http://en.wikipedia.org/wiki/GRiD_Systems), released in September. Its operating system was based on [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS).
  + Wang Laboratories introduces Freestyle. Freestyle was an application that would do a screen capture from an MS-DOS application, and let the user add voice and handwriting annotations. It was a sophisticated predecessor to later note-taking applications for systems like the Tablet PC. The operating system was [MS-DOS](http://en.wikipedia.org/wiki/MS-DOS)
* 1991
  + The Momenta Pentop was released.
  + [GO Corp](http://en.wikipedia.org/wiki/GO_Corp.) announced a dedicated operating system, called [PenPoint OS](http://en.wikipedia.org/wiki/PenPoint_OS), featuring control of the operating system desktop via handwritten gesture shapes. Gestures included "flick" gestures in different directions, check-marks, cross-outs, pig-tails, and circular shapes, among others.
  + Portia Isaacsen of Future Computing estimates the total annual market for pen computers such as those running the [PenPoint](http://en.wikipedia.org/wiki/PenPoint) OS to be on the order of $500 Million.
  + NCR released model 3125 pen computer running MS-DOS, Penpoint or Pen Windows.
  + The [Apple Newton](http://en.wikipedia.org/wiki/Apple_Newton) entered development; although it ultimately became a [PDA](http://en.wikipedia.org/wiki/Personal_Digital_Assistant), its original concept (which called for a larger screen and greater sketching capabilities) resembled that of a tablet PC.
  + [Sam Tramiel](http://en.wikipedia.org/w/index.php?title=Sam_Tramiel&action=edit&redlink=1) of [Atari Corp.](http://en.wikipedia.org/wiki/Atari) presented the "[ST-Pad](http://en.wikipedia.org/wiki/Atari_ST)" (codenamed "STylus") at the [CeBIT](http://en.wikipedia.org/wiki/CeBIT) '91 in [Hanover](http://en.wikipedia.org/wiki/Hanover), [Germany](http://en.wikipedia.org/wiki/Germany). The computer never went into production.
* 1992
  + GO Corp shipped PenPoint and IBM announced IBM 2125 pen computer (the first IBM model named "ThinkPad") in April.
  + [Microsoft](http://en.wikipedia.org/wiki/Microsoft) releases [Windows for Pen Computing](http://en.wikipedia.org/wiki/Windows_for_Pen_Computing) as a response to the PenPoint OS.
* 1993
  + The IBM releases the [ThinkPad](http://en.wikipedia.org/wiki/ThinkPad), IBM's first commercialized portable tablet computer product available to the consumer market, as the [IBM](http://en.wikipedia.org/wiki/IBM) [ThinkPad](http://en.wikipedia.org/wiki/ThinkPad) 750P and 360P
  + Apple Computer announces the Newton PDA, also known as the Apple MessagePad, which includes handwriting recognition with a stylus.
  + [AT&T](http://en.wikipedia.org/wiki/AT%26T) introduced the [EO Personal Communicator](http://en.wikipedia.org/wiki/EO_Personal_Communicator) combining PenPoint with wireless communications.
  + BellSouth released the [IBM Simon](http://en.wikipedia.org/wiki/IBM_Simon) Personal Communicator, an analog cellphone using a touch-screen and display. It did not include handwriting recognition, but did permit users to write messages and send them as faxes on the analog cellphone network, and included PDA and Email features.
* 1999
  + The "QBE" pen computer created by [Aqcess Technologies](http://en.wikipedia.org/w/index.php?title=Aqcess_Technologies&action=edit&redlink=1) wins [Comdex](http://en.wikipedia.org/wiki/Comdex) Best of Show.
* 2000
  + The "QBE Vivo" pen computer created by [Aqcess Technologies](http://en.wikipedia.org/w/index.php?title=Aqcess_Technologies&action=edit&redlink=1) ties for [Comdex](http://en.wikipedia.org/wiki/Comdex) Best of Show.
* 2001
  + Bill Gates of Microsoft demonstrates first public prototype of a Tablet PC (defined by Microsoft as a pen-enabled computer conforming to hardware specifications devised by Microsoft and running a licensed copy of the "Windows XP Tablet PC Edition" operating system) at [Comdex](http://en.wikipedia.org/wiki/Comdex).
* 2003
  + Fingerworks develops the touch technology and touch gestures later used in the Apple [IPhone](http://en.wikipedia.org/wiki/IPhone).
* 2006
  + Windows Vista released for general availability. Vista included the functionality of the special Tablet PC edition of Windows XP.
* 2008
  + In April 2008, as part of a larger federal court case, the gesture features of the Windows/Tablet PC operating system and hardware were found to infringe on a patent by [GO Corp.](http://en.wikipedia.org/wiki/GO_Corp.) concerning user interfaces for pen computer operating systems.

**CHAPTER: 7**

**7.1 FUTURE SCOPE**

**7.1.1**[**Facebook Creating Application for All Tablets**](http://www.allfacebook.com/facebook-creating-application-for-all-tablets-2011-01)

Facebook may have left the task of creating a native application for the iPad to third-party developers, but it appears that the company plans to create something to run on alltablets, including the Apple device.



Figure7.1: [**Facebook Creating Application for All Tablets**](http://www.allfacebook.com/facebook-creating-application-for-all-tablets-2011-01)**.**

The social network’s Chief Technical Officer Bret Taylor told TechCrunch’s M.G. Siegler, “We need to make a tablet version of Facebook. It’s something we’re working on right now.”

This stance jibes with the social network’s active embrace of Hypertext Markup Language 5 for Facebook coding and work by third-party application developers. HTML5 promises easier coding for an increased diversity of platforms, which would include tablets.

**7.1.2** [**How Can Android Tablets Succeed?**](http://www.pcmag.com/article2/0,2817,2376746,00.asp)  
Is there a single key to Android tablets' future success? It's a quesiton many of us have been asking lately. We're not unfamiliar with the contenders: Here at PCMag we've spent a fair amount of time with the Apple iPad (this author owns one) and an increasing amount of time with a variety of shipping and pre-production Android-based tablets (the Samsung Galaxy Tab is a frequent guest here and we saw numerous devices at CES 2011). What we've seen, thus far, offers few concrete answers.

Instead of relying on the opinions of developers or our guesses at what consumers think, we decided to ask them. Below and through [this link](http://twtpoll.com/ww9wba) is a survey that asks many of the same questions the IDC put to developers. However this time we're opening it up to all of you—those who may be in the market for one of the many Android tablets heading to market this Winter and Spring.

**7.1.3** [**Multiple sized Motorola tablets coming**](http://goodereader.com/blog/tablet-slates/multiple-sized-motorola-tablets-coming/)

To have just have one entry into the tablet market is perhaps not the best of business strategies. The latest to endorse this sentiment is none other than Sanjay Jha, the CEO at Motorola Mobility, who has echoed this train of thought at Motorola’s earnings call.  He proclaimed that now is the time for Motorola take the full plunge into the tablet computer game.

Figure7.2: Motorola Xzoom Tablet

**7.1.4** [**Apple's iPad celebrates first birthday**](http://news.idg.no/cw/art.cfm?id=D135633A-1A64-67EA-E483F0E2D078611B)  
It is year to the day since Steve Jobs introduced the iPad to the world at the Yerba Buena Center for the Arts in San Francisco.

The iPad is one year old today - that is, if you consider its birthday to be the day it was first shown off to the world by Steve Jobs.

Jobs took to the stage at the Yerba Buena Center for the Arts in San Francisco on 27

Figure7.3: iPad Birthday

January 2010 and announced the iPad, calling it "the best browsing experience you've had".However, the critics were confounded by the runaway success of the iPad. Apple recently announced that 7.33 million units were sold in the quarter ending 25 December 2010 and the iPad utterly dominates the media tablet sector, according to figures from IDC.

**7.1.5** [**Lenovo Takes on Apple With `Extreme Focus' on LePad, LePhone**](http://www.bloomberg.com/news/2011-01-27/lenovo-taking-on-apple-with-extreme-focus-on-lepad-lephone-liu-says.html)

Lenovo Group Ltd., China’s biggest maker of personal computers, said it will put an “extreme focus” on the further development of LePad and LePhone, its answers to Apple Inc.’s iPad tablet and iPhone smartphone.

“We have an extreme focus on the innovation of LePad and LePhone because these products will dominate the future market,” Chairman Liu Chuanzhi said in an interview at the World Economic Forum in Davos. “Anyone who loses this battle will be phased out from the history of this industry.”

Lenovo, maker of Thinkpad laptops, is diversifying in a quest to boost revenue. It started selling the LePhone in China’s domestic market in May, and plans to launch the LePad by the end of this quarter, according to Liu. The iPhone is Apple’s top-selling product, accounting for 39 percent of revenue last fiscal year. The iPad, introduced in April, accounted for 17 percent of revenue last quarter.

“History has proved we are good at catching up with the market’s leaders,” Liu said. “Though Apple is winning a significant share in the Chinese market, it has not gained a clearly leading position yet. Our advantage is we know this market better.

**7.1.6** [**Acer is Entering the Tablet Market with Three all New Devices**](http://topwirexs.com/acer-is-entering-the-tablet-market-with-three-all-new-devices/171250/)

Acer Inc., the second largest manufacturer of computers have brought out three whole new tablet devices to compete with the leading leader in the market – Apple’s iPad. All three tablets will have Wi-Fi connectivity with the capability of 3G and priced at around $299 to $699.

Acer has made it known that the first two of the three devices will have screens that are 7 inch and 10.1 inch respectively and will operate on Google Inc’s Android platform. They will be brought out in the market from April. The third device will run on Microsoft Corp’s Windows software and will be available as early as February.

**7.1.7 Dell Streak Tablet, $100**  
Is Dell's Streak a tiny tablet or a big smartphone? Our reviewer isn't sure; read "[Dell Streak: A Smartphone With a Tablet Heart](http://www.pcworld.com/reviews/product/440192/review/streak.html)" for her take on the device. At launch, Dell was selling the Streak for $300 with a service contract, or $550 unlocked. Now, however, [you can get the Streak for only $100](http://www.dell.com/us/p/mobile-streak/pd?refid=mobile-streak&dgc=CJ&cid=47997&lid=1485287&acd=10807495-1798476-) with a 2-year AT&T contract.



Figure7.4: Dell Streak Tablet

**7.2** [**Four things every tablet needs to succeed**](http://www.betanews.com/joewilcox/article/5-things-every-tablet-needs-to-succeed/1296060431)  
**1. Right price:** Apple has set entry price at $499. Contenders must go lower, to open up mass-market competition and rapidly gain share against iPad.

**2. No carrier commitment:** Early tablet contenders, such as the Samsung Galaxy Tab, are going to market with the wrong lower-price strategy. Carriers subsidize costs and require two-year contractual commitments. If T-Mobile didn't demand a data plan, I would have purchased a Galaxy Tab months ago. Other consumers will balk, too, at adding an additional data fee on top of their smartphone plans.

**3. Broad distribution:** Apple didn't launch iPad into a vacuum but with lush sales and distribution environment.

**4. Massive marketing.** Other than Apple, Samsung is the only tablet manufacturer doing anything close to meaningful advertising.

**7.3** [**RIM Playbook to better the iPad in battery life**](http://goodereader.com/blog/tablet-slates/rim-playbook-to-better-the-ipad-in-battery-life/)

Moving over from the Motorola XOOM or the HP WebOS based tablet devices, the Playbook tablet from Research in Motion also has thrown their hat in the ring and is hyping their Playbook tablet. While that will only add to a successful launch of the tablet device, what is most interesting is the fact that the RIM boffins are not shying away from targeting the mighty iPad from Apple in their eagerness to push forward the Playbook. RIM has singled out the one aspect of the iPad that is also considered one of the strongest points of the Apple tablet – its battery performance, which being on the better side of a full 10 hours is often seen as a benchmark for most tablet devices.



Figure7.5: [**RIM Playbook Tablet battery life**](http://goodereader.com/blog/tablet-slates/rim-playbook-to-better-the-ipad-in-battery-life/)

RIM has decided to play the role of the game changer in this aspect and is claiming it will comprehensively better the iPad in this respect. RIM’s senior marketing VP Jeff McDowell has gone on record claiming their BlackBerry PlayBook tablet will have “equal or greater” battery life than the Apple iPad while still having a battery pack that is smaller than the one that powers the Apple tablet.

However, this does not come as a surprise considering the fact that the PlayBook tablet itself sports a smaller dimension than the iPad and has a smaller 7 inch display compared to the 9.7 inch display on the iPad. Hence, its all but natural for the PlayBook to have a lower battery requirement than the iPad.

**7.4** [**Notion Ink Adam Hands on Review**](http://goodereader.com/blog/tablet-slates/notion-ink-adam-hands-on-review/)

Welcome to the official Good e-Reader hands on Review of the most eagerly anticipated Tablet PC of 2011, the Notion Ink Adam. We have the highest end version you can possibly get the 10.1 Inch Pixel-QI 3G WI-FI.  Can this device live up to the viral hype that surrounded it during the entire development process? Or is it really everything it was billed to be?

Figure7.6: Notion Ink Adam Tablet Review

One of the great features on the Adam that proved to be the most fun in the first 10 hours of playing with the device is the swivel camera that actually adjusts itself in an arc, unlike many netbook and tablet cameras that have a fixed position. The camera can move a total of 180 degrees and can take pictures or video! It is also 3.2 MP! Solid!

There are many heavily customized programs for your day to day tasks that are unlike any other tablet experience you may have found so far. Essential day to day apps are tremendously revised and allow for a more intuitive experience with the Adam. We found the Email client (Mail’d) File Browser (sniffer) Web browser, paint (Canvas) had the best experience so far.  
With the web browser we were able to view Adobe FLASH content and embedded Youtube videos right out of the gates! It was fast and stable and a nice treat. **So many budget tablets come out and do not even have the ability to play embedded youtube videos.**

**7.5** [**Samsung Galaxy Tab Deals- Sweetening the offer**](http://www.prwallstreet.com/5743/seo-press-release-Samsung_Galaxy_Tab_Deals_Sweetening_the_offer.html)

Samsung Galaxy Tab is one phone that came very near to challenge the monopoly of iPad.

But, it would not be apt to say that it rally challenged the Apple tablet. However, it was not a complete failure either. In its own space, it is a success of sorts. Almost all the major network providers offered quite attractive Samsung Galaxy Tab Deals to pull the customers their way.   
  
On the features front, the Samsung Tablet PC do not clearly lag behind the iPad. Its 7.0 inches TFT capacitive touchscreen offers a resolution of 600\*1024pixels. With its Android operating system and 1GHz processor speed is not a big issue. So far as connectivity is concerned, users get multiple options like Bluetooth, EDGE, WLAN, GPRS. Available in two classical colors of Grey and Black it also offers many useful applications that make it useful for business and corporate users. Apart from them the handset have found likeness among the masses too.

**7.6** [**More details emerge about HP's new webOS tablets: Touchpad name, Beats Audio, tons of cloud storage**](http://www.zdnet.com/blog/computers/more-details-emerge-about-hps-new-webos-tablets-touchpad-name-beats-audio-tons-of-cloud-storage/4911)

So we already know that HP is planning both a 9-inch and 7-inch tablet based on the webOS it acquired last year from Palm. We know the 7-inch Opal will be released in September, but the 9-inch Topaz may appear as early as March. The leaks are continuing, and more information about HP’s tablet PC push is surfacing.

First, the company may be rolling out the name HP Touchpad for these tablets, according to a trademark HP just applied for. It could be a ruse, but it could also point to a webOS future that furthers de-emphasizes its Palm roots.

In addition, [Engadget has received more tips](http://www.engadget.com/2011/01/19/hp-palm-tablet-to-feature-touchstone-dock-cloud-storage-beat) about the tablet specs themselves. They will be using the Beat Audio technology HP has been developing, and there could be a Touchstone charging dock that could turn the “Touchpad” into an alarm clock and digital photo frame. Another cool touch literally is the ability to tap an HP tablet and forthcoming smartphone together to share files.



Figure7.7: HP Tablet

Finally, HP could be using the cloud in a way that Apple hasn’t embraced yet. You’ll supposedly be able to wirelessly access your music collection, which may be a result of the “tens of gigabytes” of cloud storage that will be provided buyers. No details on whether this will require any kind of monthly fee, but it may force Google and Apple to speed their own music cloud services to market.

## 7.7 Comparison with laptop computers

The advantages and disadvantages of tablet computers are highly subjective measures. What appeals to one user may be exactly what disappoints another. The following are commonly cited opinions of tablet computers versus [laptops](http://en.wikipedia.org/wiki/Laptop):

### Advantages

* Usage in environments not conducive to a keyboard and mouse such as lying in bed, standing, or handling with a single hand.
* Lighter weight, lower power models can function similarly to dedicated reading devices like the [Amazon Kindle](http://en.wikipedia.org/wiki/Amazon_Kindle).
* Touch environment makes navigation easier than conventional use of keyboard and mouse or touch pad in certain contexts such as [image manipulation](http://en.wikipedia.org/wiki/Image_manipulation), or mouse oriented games.
* Digital painting and image editing are more precise and intuitive than painting or sketching with a mouse.
* The ability for easier or faster entery of diagrams, mathematical notations, and symbols.
* Allows, with the proper software, universal input, independent from different keyboard localizations.
* Some users find it more direct and pleasant to use a stylus, [pen](http://en.wikipedia.org/wiki/Digital_pen) or finger to point and tap on objects, rather than use a mouse or touchpad, which are not directly connected to the pointer on screen.

### Disadvantages

* Higher price — convertible tablet computers can cost significantly more than non-tablet portable PCs although this premium has been predicted to fall.
* Input speed — handwriting or typing on a [virtual keyboard](http://en.wikipedia.org/wiki/Virtual_keyboard) can be significantly slower than [typing speed](http://en.wikipedia.org/wiki/Typing_speed) on a conventional keyboard, the latter of which can be as high as 50-150 [WPM](http://en.wikipedia.org/wiki/WPM); however, [Slideit](http://en.wikipedia.org/wiki/Slideit), [Swype](http://en.wikipedia.org/wiki/Swype) and other technologies are offered in an effort to narrow the gap.
* Ergonomics - a tablet computer, or a folded slate PC, does not provide room for a wrist rest. In addition, the user will need to move their arm constantly while writing.
* Weaker video capabilities - Most tablet computers are equipped with embedded graphics processors instead of discrete graphics cards. In July 2010, the only tablet PC with a discrete graphics card was the [HP TouchSmart](http://en.wikipedia.org/wiki/HP_TouchSmart) tm2t, which has the [ATI](http://en.wikipedia.org/wiki/ATI) [Mobility Radeon](http://en.wikipedia.org/wiki/Mobility_Radeon) HD5450 as an optional extra.
* Business-oriented tablet personal computers have been slow sellers from 2001 to date.
* Screen risk - Tablet computers are handled more than conventional laptops, yet many are built on similar frames; in addition, since their screens also serve as input devices, they run a higher risk of screen damage from impacts and misuse.
* Hinge risk - A convertible tablet computer's screen hinge is often required to rotate around two axes, unlike a normal laptop screen, subsequently increasing the number of possible mechanical and electrical (digitizer and video cables, embedded WiFi antennas, etc.) failure points.

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