Tablet PC

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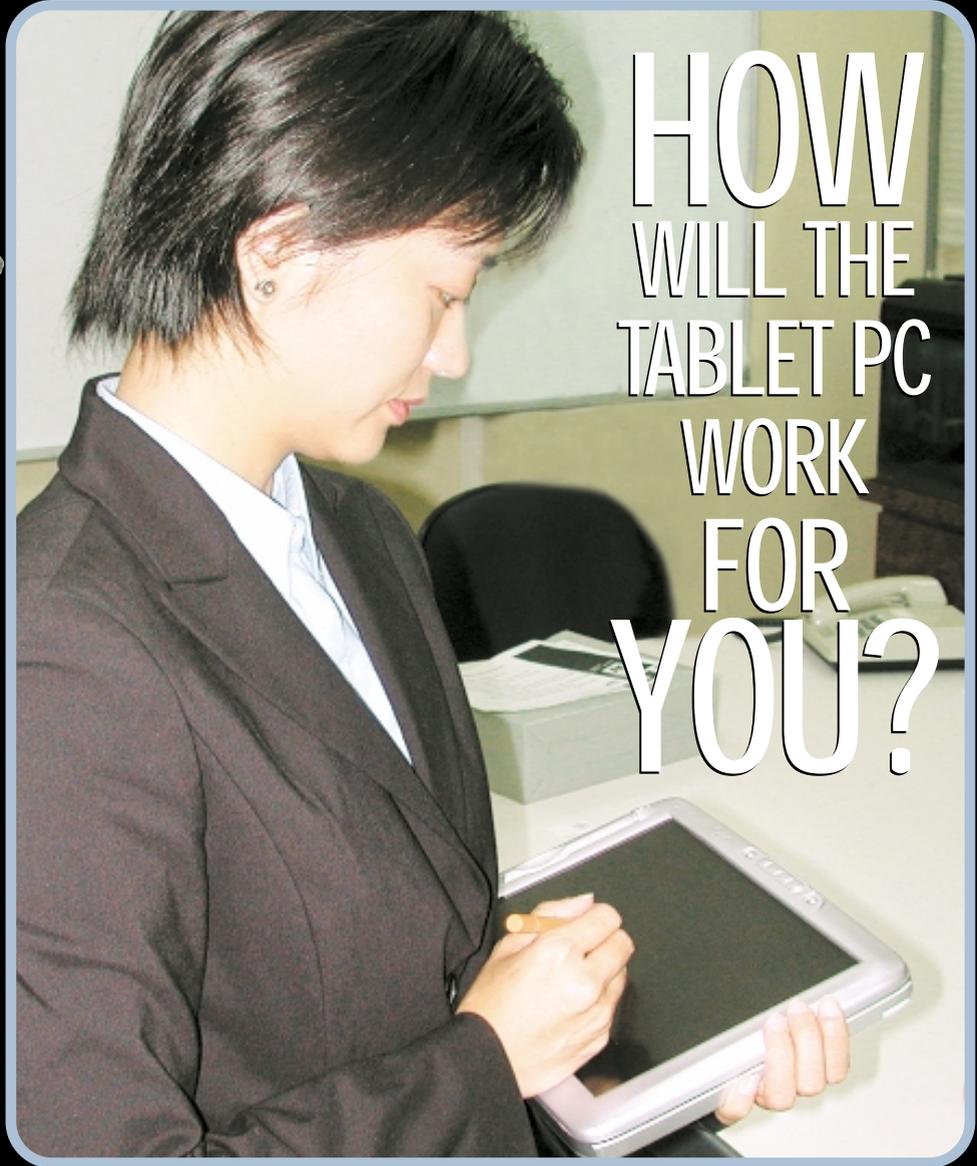
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COMING SOON TO A NEWSSTAND NEAR YOU

By Geoff Walker

Tablet PC Update

Lots of publicity, yet Microsoft plays it close to the vest. Here is what has happened with the Tablet PC since the initial Tablet PC feature in the July 2001 issue of Pen Computing

Microsoft's Eddie Wu and Robert Williams

CHANGES AT A GLANCE

MANY CHANGES HAVE TAKEN PLACE IN THE TABLET PC PROJECT DURING THE EIGHT MONTHS SINCE THE FIRST ARTICLE. The important changes can be summarized as follows:

● **Microsoft has made minor changes in the Tablet PC positioning**

● **More OEMs and ODMs have joined the project and announced their intentions**

● **A number of OEMs and ODMs showed hardware prototypes at Comdex 2001**

● **"Windows XP Tablet PC Edition" was announced at Comdex 2001**

● **XP Tablet was promoted from an "add-on" to a full-fledged version of Windows**

● **The Beta-1 version of XP Tablet and the associated SDK were released in October**

● **Microsoft published the Tablet PC Hardware Requirements document**

All of the changes can be grouped into four major categories:
(1) marketing,
(2) the Tablet PC OEMs & ODMs,
(3) software, and
(4) hardware.

MARKETING

Positioning

The Tablet PC is still the "evolution of the laptop," but there have been subtle changes in Microsoft's messaging. The Tablet PC is now positioned as a "pure superset of today's laptop PCs." The Tablet PC marketing team is making sure that the Tablet PC is not seen as a "laptop without a keyboard," as I described it in July 2001. The Tablet PC is now clearly identified (e.g.

in the FAQ on the Microsoft website) as having "attahced or detachable keyboards." The following extract from the Microsoft Tablet PC website clearly illustrates the new positioning:

"First and foremost, the Tablet PC is a pure superset of today's laptop PCs. In fact, many Tablet PCs will look exactly like today's traditional clamshell designs complete with a full keyboard but will have a mechanism that converts the hardware into a slate form. Others will have a pure slate form factor. Regardless of the design, Tablet PCs will be among the most mobile PC ever made, with exceptionally long battery life, light weight, and many with built in wireless capability. But the Tablet PC is more than just a great laptop. It also enables users to run Windows and Windows applications using a pen, annotate documents, create handwritten documents using "digital ink" for later reference or even conversion into text. Just like today's portable PCs, Tablet PCs can be put into a docking station at a desk to support a large screen monitor, mouse and full size keyboard. Either as a pure slate or as a convertible model the Tablet PC is the evolution of the laptop – all the functionality of a laptop with added Tablet functionality."

The positioning is especially obvious when Microsoft marketing managers use the Acer prototype convertible (first shown by Bill Gates in his Comdex 2001 keynote) as their primary demo machine. A single sample of that prototype is worth thousands of words. It's so obviously a laptop, and yet, when the screen is flipped around, it's a pure tablet (slate). It brings home the "superset of the laptop" message so strongly that it makes me feel a little sorry for the majority of the Tablet PC OEMs who are creating pure tablets. In retrospect, perhaps Microsoft should have tried even harder than they did to get more OEMs to build convertibles. (See the sidebar on convertibles for a brief history of the convertible genre.)

Target Market

In Alex Loeb's Tablet PC strategy presentation at WinHEC 2001, she identified the "corporate worker [who] spends a significant amount of time away from [their] desk in formal or informal meetings" (a corridor cruiser) as "Microsoft's first focus." In light of Microsoft's current emphasis on the Tablet PC as a "pure superset of today's laptop PC," I believe that Microsoft's "first focus" has shifted to the road warrior who wants to replace their existing ultraportable laptops. This belief is supported by Alex's statement in the Q&A on page A13 that "many will see the value in replacing their current laptops [with Tablet PCs] right away."

Pricing

When asked about pricing, Microsoft always says that Tablet PC pricing will be determined solely by the OEMs (which of course is true). A few relevant comments on pricing appeared in the media shortly after Comdex 2001, as follows:
• In a story in *Computerworld*, David Lee, director of mobile product marking at Taiwan-based Acer, said he expects the machines to sell for less than $2,000. A story in *PC World* said that Acer expects to price its convertible Tablet PC at about the same as a laptop with a 10-inch display.
• In the same story in *Computerworld*, Kyle Thornton, a product marketing manager at Fujitsu, said he expects Tablet PCs to sell in the range of $1,600 to $2,300.
• In a story in *eWeek*, Ted Clark, vice president of the Tablet PC group at Compaq, said that he expected Compaq's Tablet PCs to cost several hundred dollars more than a comparable laptop.
• A story on *ZDNet* reported that Tablet PCs are expected to cost about $2,000 and may come down in price as manufacturers increase volumes.
• Bill Gates, in an interview with *Information Week*, said he expects that most computer manufacturers will price their Tablet PCs in roughly the same range as today's business laptops.
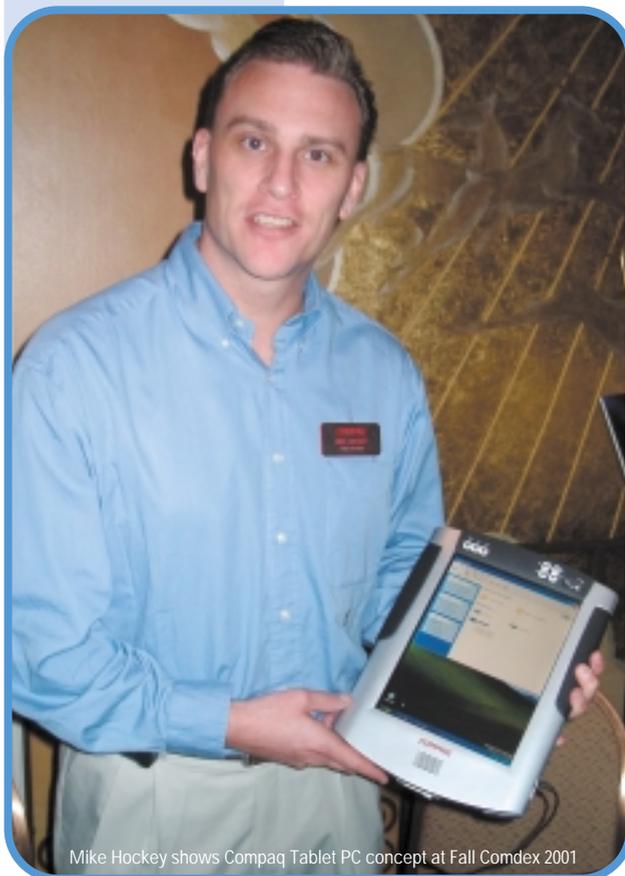
Based on all available information, it seems very clear at this point that essentially all of the Tablet PCs currently under devel-
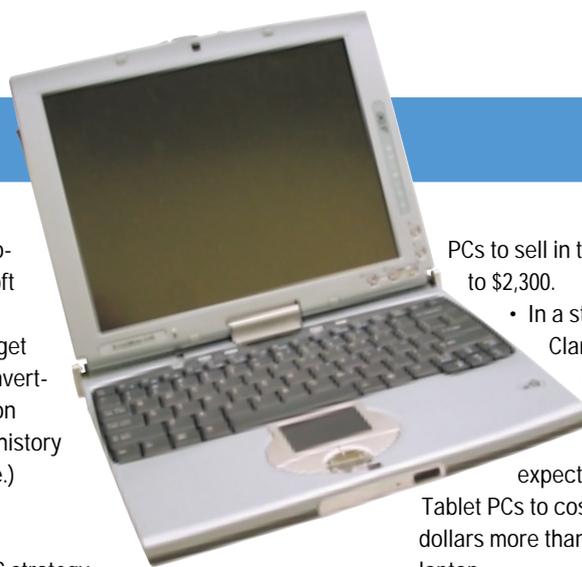
OF INTEREST

"We see the majority of portable PCs shipped to be Tablet PCs within five years."

Alex Loeb, Microsoft

Mike Hockey shows Compaq Tablet PC concept at Fall Comdex 2001

opment can be categorized as "ultraportable laptops" from the viewpoint of size, weight, CPU MHz and screen size. Table 1 lists ten ultraportable (business) laptops currently on the market, along with their basic specifications and street price as of January 2002. The average of these ten ultraportable laptops is a 0.9-inch thick unit weighing 3.3 pounds with a 12.1″ LCD and a 770 MHz Pentium III, costing $2,083. This average is a very reasonable target expectation for the first crop of Tablet PCs.

Volume Estimates

Anticipated volumes are harder to nail down than anticipated pricing. Synthesizing all the information I've collected over the past eight months from OEMs, ODMs, ISVs, Microsoft and many other sources, I believe that a realistic estimate

TABLE 1: CONVENTIONAL ULTRAPORTABLE LAPTOPS

MODEL	THICK (IN.)	WEIGHT	LCD (XGA)	CPU	STREET PRICE
Compaq Evo N200	0.8	2.5 lbs	10.4"	700 MHz ULV P3	$1,821
Compaq Evo N400c	0.9	3.5 lbs	12.1"	850 MHz P3	$2,110
Dell Latitude C400	1.0	3.6 lbs	12.1"	1.2 GHz P3	$2,638
Dell Latitude L400	1.0	3.4 lbs	12.1"	700 MHz P3	$2,296
Gateway Solo 34350	0.8	3.8 lbs	12.1"	750 MHz P3	$1,878
HP Omnibook 500	1.0	3.5 lbs	12.1"	700 MHz P3	$2,623
KDS ThinNote 376CH	1.0	3.2 lbs	12.1"	600 MHz P3	$1,326
Sharp PC-UM10	0.7	2.9 lbs	12.1"	600 MHz ULV P3	$1,758
Sony PCG-R505	1.0	3.8 lbs	12.1"	850 MHz P3	$2,135
Toshiba Protege 2000	0.7	2.6 lbs	12.1"	750 MHz P3	$2,199
Average	0.9	3.3lbs	12.1"	770 MHz P3	$2,083

Notes: All laptops are configured with 20 GB HDD and 256 MB DRAM
Street prices are midpoint of range reported by search engines as of 1/21/02

Some adjustments could be made to the average cost shown above. For example, while the contract price of a 12.1″ XGA LCD in Taiwan today is about $170, the contract price of a 10.4″ XGA LCD is about $200 (that's right, it's $30 higher, even though it's smaller, due to much lower production volume). In addition, the contract price of an active digitizer is around $50. If the Tablet PC is a convertible, there might be a few extra dollars for the special hinging mechanism. All told, there's probably roughly $100 incremental material cost for a 10.4″ Tablet PC compared to the ultraportable laptops in the table. If the Compaq Evo N200 (for example) were to be turned into a Tablet PC, that would mean a street price of about $2,000. Gee, sounds about right!

SPOTLIGHT: MICROSOFT TABLET PC EXECUTIVES

It's been said for years that the pen tablet (now Tablet PC) is one of Bill Gates' favorite "holy grails of personal computing." Apart from Bill Gates, however, there are two other key Microsoft executives driving the Tablet PC project: Dick Brass and Alexandra (Alex) Loeb.

Dick Brass

A little over a year ago, John Markoff of the New York Times wrote a profile of Dick Brass entitled "Brass in the Middle of Microsoft's Cultural Shift." The remainder of this sidebar is abstracted verbatim from John's article and combined with additional information from Dick Brass' executive biography on the Microsoft website.

Dick Brass, Vice President, Technology Development Relationships (responsible for the Tablet PC, e-book software and e-book devices), has been at Microsoft for four years. He came to Microsoft in order to pursue his personal mission of introducing the world to a new kind of computer: a fully powered Windows tablet, unfettered by keyboard or cables, that would always be with its owner, always turned on and always wirelessly connected to the Internet. Just two weeks after he came to Microsoft to work on electronic books in 1997, he was able to convince Bill Gates of the importance of his idea after showing him an ultra-slim wooden model of the dream machine that had been put together by a cabinet maker who had worked on Brass' yacht.

Brass is an anomaly in Microsoft hothouse hacker's culture, because he is probably known more for his love of good food and wine and his passion for yachting than for his technical accomplishments. And yet Brass may be the best evidence that Microsoft is in the midst of a fundamental cultural shift. Brass' supporters say that he has the vision and leadership that Microsoft badly needs as it searches for new directions.

In 1979, while Brass was a features editor for the *Daily News* of New York, it dawned on him one day that it might be possible to turn a thesaurus into a computerized reference. He did just that and today is still credited as the inventor of the first electronic thesaurus (The Random House Electronic Thesaurus) and the first dictionary-based spelling checker software. In 1983, his firm, Dictronics Publishing, acquired the exclusive electronic rights to many of the world's most important reference works, including *The Random House Dictionary*, *Roget's International Thesaurus*, *Black's Law Dictionary*, the *Chicago Manual of Style*, and similar works abroad. Wang Laboratories purchased Dictronics in 1983, and Brass then served as director of Electronic Publishing at Wang.

Brass moved to Seattle in the mid-1980s with a friend to start a company called General Information, which created the first PC-based telephone directories. It was an idea that would blossom a decade later, but General Information was ahead of its time and the two men were eventually forced to sell the company without a profit.

for the total volume in the first twelve months of all Tablet PC shipments is somewhere between 500,000 and one million units. This volume will be spread over twelve to 14 OEMs. Calculating an average volume per OEM isn't meaningful, because I believe what will happen is that a few (perhaps three) OEMs will "get it right" and sell 100 to 150 thousand each, while the remaining OEMs will sell 25 to 50 thousand each for a total of around 750K units. By "get it right" I mean the right combination of look and feel (industrial design), CPU horsepower, battery life, dockability, weight, screen size, ease of use, etc.

According to IDC, the total number of laptops (of all sizes) sold in 2001 was about 26 million. A volume range of 500,000 to one million means that the Tablet PC would account for about 2-4% of 2001's total laptop volume. That feels like a reasonable number for the first year of a new form factor with a new OS (note that volume at this level would significantly outperform the first year of Windows CE 1.0 products!). IDC analyst Alan Promisel's estimate of the Tablet PC's first year volume is 1-3% of the laptop market, a slightly less optimistic.

Acer, on the other hand, is predicting that Tablet PCs will account for about 10% of the laptop market in 2002 (as reported in the United Daily News Chinese-language newspaper, and translated in a story on DigiTimes.com). That would be at least 2.6 million units, which is completely impossible, given that the Tablet PC isn't even going to start shipping until the second half of 2002. Acer is even more optimistic for 2003, predicting that Tablet PCs will represent up to 25-30% of the overall laptop market in 2003.

Reporting on spoken comments by company executives, combined with translation from Chinese to English, can be a tricky business. It's possible that Acer meant that the Tablet PC would account for 25-30% of the ultraportable laptop market in 2003 (the first full year of shipments). According to IDC, ultraportable laptop shipments in 2003 are forecasted to be 4.6 million units. 25% of 4.6 million is 1.15 million, only slightly above the one million upper-end esti-

VIA reference design

In 1989, Brass bought a Macintosh computer for a friend so that the friend could produce a proper business plan for his new venture, Omnipoint, a wireless telephone network that was eventually acquired by Voicestream for $2 billion. Because he was given a one percent stake in Omnipoint in exchange for the Macintosh, the favor made Brass a millionaire many times over.

Brass was hired by Oracle in 1989 after persuading Larry Ellison that there was money to be made from broadcasting the content of newspapers to PCs. Brass stayed at Oracle for eight years, first as president of Oracle's Data Publishing subsidiary, and then as senior vice president for Corporate Affairs. In the latter position, he was involved in strategy and writing speeches for Ellison — who is known for having publicly taunted Gates. Brass even acknowledges being an accomplice to the group of Silicon Valley executives that worked behind the scenes to help persuade the Justice Department to bring its antitrust suit against Microsoft. In this context, Brass' move from Ellison to Gates was a change of allegiance worth of the novel "Shogun."

Dick Brass works for Jeff Raikes, Group Vice President for Productivity and Business Services. Jeff Raikes works for Steve Ballmer, CEO of Microsoft. It's interesting to note that Jim Allchin, the Group Vice President for Platforms (i.e., responsible for all versions of Windows) is not in the chain of command for the Tablet PC, even though XP Tablet is in fact a version of Windows. This is because the Tablet PC is still considered an "emerging technology" rather than a standard Windows product. ◆

Alexandra Loeb

Alex, who works for Dick Brass and is responsible for about 200 people, has been at Microsoft for 13 years. Her initial assignment was as a member of the Network Business Unit, where she was the program manager in charge of shipping Microsoft LAN Manager 1.01 and 2.0 Later she shifted her focus to developing technical information for internal and external field product support for various high-end products such as LAN Manager, Microsoft SQL Server" and Windows NT. She spent two years in Microsoft's Sales and Marketing Division, launching Microsoft TechNet and TechEd and expanding Microsoft's Certified Professional Program.

In 1994, Alex returned to the product side of Microsoft, where she became product unit manager for Microsoft Publisher and the Media Store until joining Microsoft Research in 1997. At Microsoft Research, she initiated what became the Microsoft Office Document Imaging project.

Since 1999, Alex has been leading the Tablet PC project as General Manager, responsible for all development, design and marketing of the Tablet PC. Most recently, in January of this year, Alex was promoted to Corporate Vice President, Tablet PC Division. Alex becomes the eleventh female VP at Microsoft. Her elevation to vice president is a sign that Microsoft is placing increasing importance on the Tablet PC project. "It does send a signal that the Tablet PC is a pretty big bet," a Microsoft spokesman was quoted as saying in a Reuters News Service story on January 17. ◆

CONVERTIBLES

IBM ThinkPad 360PE

A convertible can be defined as a portable, notebook-style computer built in a way that allows it to be used as either a traditional notebook (with an integrated keyboard) or a pen tablet (with a pen interface). Historically, a number of different methods of constructing a convertible have been used, as follows:

1. The screen is supported on a single hinged arm that connects the rear of the notebook to the midpoint of the back of the screen. The screen can be positioned similar to that of normal notebook (with the keyboard forward), or the bottom edge of the screen can slide forward until the screen is lying flat on top of the keyboard. Example: GRiD Convertible in 1992 (the first convertible.

GRiDConvertible

2. The screen is supported on two hinged arms that connect the rear corners of the notebook to each side of the midpoint of the screen. The screen can be positioned similar to that of a normal notebook (with the keyboard forward), or rotated 90 degrees around its horizontal center axis and laid flat on top of the keyboard. (This is a variant of method #1; Vadem dubbed it the "SwingTop" design.) Examples: Vadem Clio in 1998 (also marketed by Sharp as the Mobilon Tripad); IBM ThinkPads 750P and 360PE in 1993 to 1995.

Vadem Clio

3. The screen is hinged at the back like a normal notebook, but it can also be rotated 180 degrees around its vertical center axis and then closed, leaving the screen facing upwards. Examples: Acer TravelMate TM100 Tablet PC; Hewlett-Packard's "Concept PC 2001" (see *Popular Science*, February 2002, page 13).

4. The screen is hinged at the back like a normal notebook, but it can also be unplugged entirely, rotated 180 degrees, then plugged back in and closed, leaving the screen facing upwards. (This is an early variant of #3.) Examples: NEC Versa 50ECP and Panasonic CF-V21P in 1995.

5. The screen opens like a normal notebook, then continues opening until it has rotated through 360 degrees and is folded underneath the notebook (this is usually called a "foldback" design). Examples: Fujitsu INTERTop in 1998; Sharp HC-7000 (also currently marketed by Intermec as the 6651 Pen Tablet).

Fujitsu INTERTop

The above five methods are the only ones that have been used to date that result in a "true" convertible, i.e., a portable computer with both a pen interface and an integrated keyboard. Pen tablet vendors have used two other methods to accomplish a similar purpose, as follows:

■ A pen tablet built with a detachable keyboard so that it works like a notebook when it's on a desk. Examples: Compaq Concerto and Telepad-3 in 1995.

■ A pen tablet and a keyboard packaged together in a "portfolio" carrying case. Examples: current Fujitsu PenCentra and Stylistic LT; Dauphin DTR-1 & 2 in the mid-1990s.

Compaq Concerto

Acer TravelMate TM100

CONVERTIBLE VS PURE TABLET

CHARACTERISTIC	CONVERTIBLE	PURE TABLET
KEYBOARD	Internal	External (direct connect or IR)
WEIGHT	Heavier due to keyboard and extra layers of housing	Lighter
THICKNESS	Thicker due to keyboard	Thinner
RUGGEDNESS	Less rugged due to hinge	More rugged
COST	Slightly higher due to hinge and keyboard	Slightly lower
DOCKABILITY	May be compromised due to screen hinge and movement	No compromise
LCD	More likely to use 12.1" to compete with ultraportables	More likely to use 10.4" for smallest size and weight
COOLING	Less need for a fan due to more heat dissipation surfaces	More need for a fan due to fewer heat dissipation surfaces

mate suggested previously. The fact that Acer is developing a convertible Tablet PC, a form factor that's likely to be much more popular than a pure tablet, can easily account for the difference in optimism.

Microsoft seems very comfortable with the one million number for the first year (a million seems to be a "threshold of interest" for Microsoft on any product – volumes less than a million just don't interest them). However, the growth rate for the following four years is anyone's guess. Starting from a base of 750,000 in the first year, a compound annual growth rate of 80% (an arbitrary number) yields a volume of almost eight million in the fifth year, or about 16% of the projected 50 million total laptop market in 2007. Again that seems within the realm of possibility if convertibles are included.

Microsoft's target is for the penetration of Windows XP Tablet PC Edition to reach 50% of all laptops in 2007. Note that this is the OS penetration rate, not the Tablet PC hardware volume. Microsoft's prediction is based on the belief that the Tablet PC will cause the use of a pen to become so compelling that pen support will be added to at least half of all laptops within five years. XP Tablet will thus become the "new mobile OS." At that point, the difference between a Tablet PC and a standard laptop will be so blurred as to be meaningless – the Tablet PC will truly have become the "evolution of the laptop."

OS Adoption Rate

One flaw I see in all of the above volume projections is that they totally ignore the issue of OS adoption rate. The Tablet PC is initially targeted at enterprise (corridor cruisers or road warriors, it doesn't really matter

Table 2: Announced Tablet PC Hardware and Software Participants

HARDWARE COMPANY	BUSINESS MODEL	ROLE
Acer	OEM	Tablet PC hardware vendor using Wistron as ODM
Compaq	OEM	Tablet PC hardware vendor using LG Electronics as ODM
FIC	ODM	Building Tablet PC for ViewSonic
Fujitsu PC	OEM	Tablet PC hardware vendor building own products
LG Electronics	ODM	Building Tablet PC for Compaq
NEC	OEM	Tablet PC hardware vendor building own products
PAD Products	OEM	Tablet PC hardware vendor using an unnamed ODM
Tatung	ODM	Tablet PC builder seeking OEM customer
Toshiba	OEM	Tablet PC hardware vendor building own products
ViewSonic	OEM	Tablet PC hardware vendor using FIC as ODM
Wistron	ODM	Building Tablet PC for Acer; seeking OEM for pure tablet

SOFTWARE COMPANY	PRODUCTS ENABLED FOR TABLET PC
Adobe Systems	Adobe Acrobat (network publishing solutions)
Allscripts Healthcare Solutions	TouchWorks (point-of-care decision support for physicians)
Amicore	Physician office software and services
Autodesk	AutoCAD, Inventor, Streamline, etc. (design solutions)
Corel	Graphics and business productivity applications
Groove Networks	Web-based collaboration solutions
Microsoft	Office XP (office productivity); Visio (business diagrams)
LexisNexis	Decision support and research solutions
Zinio Systems	Digital magazine technology and services

FIC Tablet PC prototype

which), and enterprise is notorious for being very slow to adopt a new Microsoft operating system. For example, Fujitsu, the current leader in pen tablets for corporate project-based applications, hasn't yet shipped even one copy of Windows XP to a pen tablet customer in North America. Fujitsu says that enterprise simply isn't ready to even think about moving to XP. Windows XP Tablet PC Edition is a full-fledged new version of Windows, not just XP Pro with a few files added on top (more on this later). What's going to cause enterprise to suddenly throw caution to the wind and buy a million copies of XP Tablet in the first year? Will the hardware alone be so compelling that it will totally drive sales of the new OS? I don't think so. In the first

year, Tablet PCs are going to be purchased largely by IT departments, the same way that business laptops are purchased today. IT is going to have to support XP Tablet, and the pen already has a bad reputation from the pen computing craze of the early 1990s. The result may be many "evaluation" purchases by enterprise, but no big rollouts to thousands of knowledge workers during the first year. That could put a severe crimp in everyone's expectations.

Press Reaction at Comdex 2001

In general, the press reaction to the Tablet PC announcements and demos at Comdex 2001 was not significantly different from that following Comdex 2000. Overall, it was negative to neutral. The single most common theme in the press coverage was that there simply isn't a

Dr. Gene Sheu: President, Networking and Information Group; First International Computer, Inc.

While I was in Taiwan last December I had the opportunity to meet with Dr. Gene Sheu, president of First International Computer, Inc.'s Networking and Information Group. It turned out that his wife had gone to college in Albany and he was familiar with the Albany/Troy/Schenectady area where I lived for 17 years before moving to California. Dr. Sheu presented what one might consider a holistic view of technology: It does not really matter whether the initial Tablet PC, or any one technology for that matter, succeeds. What matters is that its exploration furthers the overall state of the art, which is good for everyone.

PCM: FIC has shown some interesting Tablet PC prototypes. What is your assessment of the current situation in the desktop and notebook industry?

Dr. Gene Sheu: The PC era is clearly over. Unfortunately, there is no clear direction as to what comes next and the situation is confusing right now. We finally have good, reliable networks, but we're being confronted with too many different standards. There are lots of devices, but how do we get them all to communicate? For example,

mainland China does not allow 802.11b and there is the matter of licensing spectrum in some countries. You could say it is the worst of times and the best of times.

PCM: What trends do you see on the application side?

Dr. Gene Sheu: Content will matter. Multimedia will be important. Devices that can handle multimedia and easily bring content to people will be important.

PCM: What's your view of Webpads and the Tablet PC?

Dr. Gene Sheu: They are two different products and concepts. The Tablet PC definitely has its place. The Microsoft OS, the Microsoft name, plug and play, and the maturity of Windows are definitely a plus. In Asian cultures, especially, tablets are a natural and tablet products will expand the overall market. A keyboard is not creative. You cannot create pictures with it. A pen and ink, on the other hand, allow you to do new things. Ink will be the killer app for tablet computers. I also believe in voice recognition. A combination of pen and voice will add a new dimension, although those products will still offer keyboards as an option. As for Webpads, FIC has some interesting products there as well with our AquaPad line. Webpads must be as small and light as possible.

PCM: What are the technical issues you're facing?

Dr. Gene Sheu: The Tablet PC is a fascinating challenge. Microsoft views the Tablet PC as a high end product, so people who want more will buy Tablet PCs. These products will not have fans, they will run cool, it's like a dream. Investing in the Tablet PC is an investment in future technology. Most of the technologies used in the Tablet PC are enablers. Working on them is an investment in great future technology. We're looking at many aspects, like backups for the active digitizer.

PCM: You have been showing prototypes based both on Intel and Transmeta processor technology. Why?

Dr. Gene Sheu: We are looking at both and using our Crystal and Thunder Tablet PC prototypes to test them. From a physics point of view, Transmeta does not need many transistors to get the job done. However, Intel pushes the micron levels lower and lower, and they just may pull it (a cool-running, power-efficient processor) off. ◆

Dr. Gene Sheu, FIC

Editor of *PC Magazine*, in his editorial "On Technology: What to Expect in 2002," in the January 15th issue: "Many obstacles remain: Tablets break when dropped, drop-resistant tablets cost too much, and laptop/tablet hybrids either expose the keyboard on the underside in tablet mode or can only hide the keyboard with a fragile hinge. I fear tablets are the answer to a question not enough people are asking."

Media Confusion

Even now (March), six months away from the launch of XP Tablet, there is substantial confusion in the media about what is and isn't a Tablet PC. For example, in the January 15 issue of *PC Magazine*, there's a story entitled "Tablet PC Makers Gear Up" which is actually a review of ViewSonic's ViewPad 100 "SuperPDA" (a very solid webpad). Some of the current pen tablet manufacturers (such as ViewSonic again, not to pick on them) are already labeling their existing products as Tablet PCs. ViewSonic's data sheet on the ViewPad 1000 pen tablet clearly labels it as a Tablet PC, even though (a) Windows XP Tablet

market for Tablet PCs, that nobody needs them. This theme was most aptly expressed by Paul Thurrott, writing for *WinInfo.com*: "There's a big gap between cool and necessary."

The specific concerns expressed by the reporters weren't very surprising – they included the usual things, such as:

• People want an integrated keyboard (i.e., a convertible, not a pure tablet)
• Tablet PCs priced as high-end laptops will be too expensive
• Handwriting is too slow and inaccurate

Two of the more visible negative comments in the press were as follows:

• Jeff Hawkins, Handspring Chairman and Chief Product Officer, during his Comdex keynote: "Some ideas never die. I can't understand it. I'm surprised [Tablet PCs have] come back. It's like bell-bottom pants." [*This, from the inventor of the first pen tablet!*]
• Bill Howard, Contributing

PC Edition is not available yet, and (b) the product itself has a touch (passive) digitizer rather than the required active digitizer. This confusion is going to be with us for the rest of 2002 and probably even longer.

TABLET PC OEMs & ODMs

Announced Participants

Of the original five OEMs who announced at WinHEC 2001 that they would be building Tablet PCs (Acer, Compaq, Fujitsu, Sony and Toshiba), Sony is conspicuous for the absence of any visible activity during the last eight months. The other four OEMs have all shown Tablet PC prototypes at Comdex 2001 or in press conferences. In fact, Sony seems to be going in the other direction. In a story widely published in the press during the week of January 14, it was reported that "due to weak sales," Sony is ending production of its desktop VAIO Slimtop Pen Tablet products and will cancel development of follow-up products as well. The Slimtop wasn't a Tablet PC, but as a pen-based desktop video tablet, it's a close cousin. It's practically certain at this point that Sony won't participate in the first round of Tablet PC products.

On the positive side, a number of additional OEMs, ODMs and ISVs announced at Comdex 2001 that they are joining the Tablet PC program. The list of announced Tablet PC participants is shown in Table 2 .

Non-Participants

There are at least three big OEMs who are conspicuous by their absence from the Tablet PC program: Dell, IBM and Gateway. Each of these have recently commented in the press about why they're not participating, as follows:

• "We talk to our customers, and they haven't been telling us that this is something they absolutely want to have. [The Tablet PC] is an idea that's been around for a long, long time, and maybe this time it will work. But we like to bring things to market that are relevant." (Michael Dell, Dell's chairman)

• "IBM is not interested in developing an IBM-branded Tablet PC anytime soon. In light of the current economic slow-down and other related conditions, IBM sees the Tablet PC as an experiment that simply does not fit into IBM's current back-to-basics approach to selling IT services and related hardware. I have yet to find a customer that has asked for a Tablet PC." (Leo Suarez, IBM's vice president of worldwide product marketing

for personal computing devices) • "We dabbled in some non-PC devices over the last year, and learned a lot from our customers. We feel the focus now is on networked PCs and low-cost notebooks that can [do] the job of a Tablet PC." (Gateway representative Lisa Emard)

Comdex 2001 Prototypes

Table 3 lists the Tablet PC prototypes that were shown at Comdex 2001. Some of the prototypes were shown only at a press conference (dubbed a "Tablet PC lovefest event" by eWeek) following Gates' keynote speech on Monday night, while others were shown in the company booths at Comdex. Note that Table 3 does not include webpads, CE tablets or pen tablets that were shown at Comdex (of which there were at least 12, including ViewSonic's ViewPad 1000 pen tablet).

SOFTWARE

Good Progress On Four Fronts

Good Progress On Four Fronts In the July 2001 article, I identified four key elements of Microsoft's work on the Tablet PC program. Microsoft has made good progress on all four during

the last eight months, as follows:

• Windows XP Tablet PC Edition operating system: The Beta-1 version was released on CD at the Microsoft Professional Developer's Conference in October 2001. Access to the Beta software requires approval by Microsoft.

• Microsoft note-taking program: The program was named "Microsoft Journal" and demoed at Comdex 2001. It has no new visible features since WinHEC; the beta version is not available yet.

• Tools for software development: The Tablet PC SDK is on the same CD as the Beta-1 version of XP Tablet. A substantial portion of the SDK documentation is available in the MSDN Library.

• Tablet PC Hardware Requirements Specification: Posted on the Microsoft website October 17, 2001 (many months later than anticipated, but complete).

XP Tablet Architecture

When it was first announced at WinHEC 2001, XP Tablet was described as a layer on top of Windows XP Pro. This concept has now been abandoned, and XP Tablet has become a full-fledged member of the Windows XP family – a standalone version of Windows. The family will consist of XP Home for consumers, XP Pro for enterprise and XP Tablet for mobile. Remembering some of the difficulties that the "layer on top of Windows" approach caused in Windows for Pen Computing in the early 1990s, this change is definitely a good thing. However, it has resulted in a slip in the scheduled delivery date for XP Tablet.

When XP Tablet was simply an add-on to XP Pro, Microsoft's Tablet PC team was in more control of the schedule and the

TABLE 3: TABLET PC PROTOTYPES SHOWN AT COMDEX 2001

COMPANY	PRODUCT NAME	FORM FACTOR	LCD	CPU
Acer	TravelMate TM100	Convertible	10.4" XGA	Intel P3
Compaq	(unnamed)	Tablet	10.4" XGA	Transmeta 600 MHz
FIC	Thunder	Tablet	10.4" XGA	Intel P3 ULV 700-800 MHz
FIC	Crystal	Tablet	10.4" XGA	Transmeta 800 MHz - 1 GHz
Fujitsu	Stylistic 3500 (mod.)	Tablet	10.4" XGA	Intel Celeron 500 MHz
Intel	(reference design)	Tablet	8.4" SVGA	Intel P3 ULV
Tatung	Tangy 440	Tablet	10.4" XGA	Intel P3 ULV 700 MHz
Toshiba	(unnamed)	Tablet	(unknown)	(unknown)
VIA	(reference design)	Tablet	10.4" XGA	VIA C3
Wistron	(unnamed)	Tablet	10.4" XGA	Intel P3

expected delivery date was June 2002. Now that XP Tablet must go through the standard release and distribution method for a full version of Windows, the expected delivery has slipped to the fourth quarter of 2002. Another reason for the slip is that XP Tablet has become dependent on some of the code that will be in Windows XP Service Pack 1 (scheduled for release in the second half of 2002). Microsoft has not yet committed to a firm shipment date for XP Tablet. The official Microsoft line is that "the Tablet PC will ship in the second half of 2002." Most analysts and observers currently expect shipment in the fourth quarter ("by year's end"). The shipment date could be delayed even further by Bill Gates' recent directive that all Microsoft developers should focus on security. Since most of the Tablet PC OEMs plan to wait to ship their first product until the release of XP Tablet, further schedule slips could become very painful for the OEMs with regard to revenue and hardware competitiveness with standard laptops.

An often-asked question is "what is the basic difference between XP Tablet and the other versions of Windows XP?" The essential difference is XP Tablet's support for "ink as a data type." What this means is that when the user creates ink, instead of the ink being stored as a bit map or as just a series of point coordinates, it is stored as a data type with a set of properties. Ink data can include per-point properties (e.g., x, y, pressure, angle, time), per-stroke properties (e.g., color, anti-aliasing, curve fitting, content description), global ink properties (e.g., background recognition results and alternatives) and unique user- or appli-

cation-defined properties. At the most basic level, this allows ink to be bolded, italicized or underlined just like regular text. In advanced ink-enabled applications, this allows ink objects to be re-flowed and overlayed in ways similar to other text, graphics, vector shape and multimedia objects.

Microsoft has a plan for extending "ink as a data type" beyond XP Tablet if the Tablet PC is well accepted by the marketplace and XP Tablet actually becomes "the next mobile OS." The first level of the plan is to provide a "reader" for ink documents, similar to the way that Adobe provides a reader for PDF documents. Using the reader, a user of any other version of Windows will be able to read ink documents created on a Tablet PC. The second level will be to provide add-

in libraries for other versions of Windows that allow applications to create and manage ink documents. The third level (a long-term goal) is to make "ink as a data type" a fundamental part of all versions of Windows.
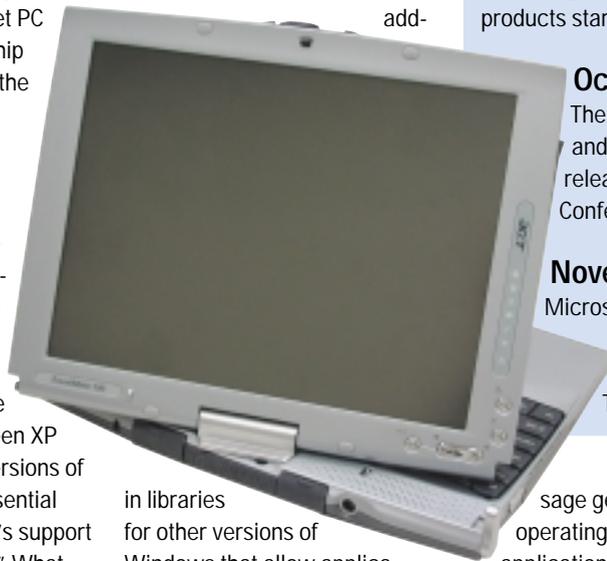
Beyond "ink as a data type," the second major difference between XP Tablet and the other versions of XP is its ability to be used with a pen as the only input device (no keyboard or mouse). The user will be able to respond to every request for input, error condition or mes-

sage generated by the operating system or an application with just a pen.

User Interface

XP Tablet's user interface is still being tuned and tweaked. While there is a substantial amount of SDK documentation available online in the MSDN Library, it's mostly aimed at helping ISVs write good pen-centric applications. (To access the documentation, go to http://msdn.microsoft.com/library and then drill down through Windows

Development – Tablet PC – SDK Documentation – Microsoft Tablet PC Platform SDK. There are more than 100 pages online, without even counting the detailed Tablet PC API Reference.)

User documentation covering the basics of using Windows with a pen doesn't seem to exist yet. However, by reading the SDK documentation you can get an idea of what it's going to be like. For example, an SDK document entitled "Making Windows Work with a Pen" includes a list of common pen gestures that

map to traditional mouse events. One of the gestures allows you to create a right-click without using a side (barrel) button on the pen. The method is as follows: touch the pen tip to the screen, hold it there for about one second. The cursor changes to an animated sketch of a menu for about one second. Lift the pen during the time the cursor is animated, and a right-click context menu appears. This sounds more difficult than it actually is. It's a little tricky at first to get used to the timing, but once you've mastered it, the gesture is easy and feels natural.

Although Microsoft's method of doing a right-click doesn't require a side button on the pen, 100% of the Tablet PC OEMs are including one or two side buttons on their Tablet PC pens. Regardless of Microsoft's stated desire to eliminate side buttons, most of the OEMs believe that it's simply easier to hold the side button and tap the screen to do a right click. Having one or more buttons on the pen also allows for more programmable (user-selectable) functions. Most desktop digitizer tablets (such as those from Wacom, http://www.wacom.com) provide a range of functions that can be assigned to the side buttons, so many existing pen users are already familiar with the use of side buttons.

In addition to a set of common gestures, Microsoft plans to include a set of application gestures for use in application programs (presumably, Microsoft will use these themselves when making Office XP and Visio pen-aware). None of these gestures are in the currently available Beta-1 version of XP Tablet. The gestures that have been defined so far include such functions as copy, paste, cut, undo, change case, backspace, new line and space. A list of "to be defined" gestures include file operations (new, open, save, print), formatting operations (bold, italic, underline), and scrolling operations (left/right/up/down to end of screen/page/document). In the SDK documentation, Microsoft notes that "there is much testing needed to understand which gestures can be reliably recognized, as well as which ones make the most sense to the user." Given the experience that the pen tablet industry has been through with gestures in the past ten years, this is a significant understatement.

Another user interface element of significant interest is the TIP (text input processor). This is the area where the user writes characters that are being input to the system. XP tablet will support both a boxed TIP (the default) and a full-window TIP. Microsoft's testing has shown that a new user with no previous pen tablet experience is most comfortable writing in a defined location (a boxed TIP), rather than anywhere on the screen. On the other hand, the pen tablet industry's experience over the past ten years has shown that experienced users definitely prefer being able to write anywhere on the screen (a full-window TIP). The choice of TIP in XP Tablet will be user-selectable, but like the gestures, this capability isn't available for testing in Beta-1.

In summarizing the software development design guidelines for ISVs, Microsoft makes a curious statement: "People will spend the majority of their time interacting with the Tablet PC using Windows and spend a comparatively small amount of time using true pen-based applications." Thinking about how people use laptops today, this would seem to be very untrue – most people spend the majority their time in applications, not interacting with Windows. Perhaps the statement is simply a reflection of the Tablet PC development team's apparent orientation towards "doing cool things with Windows on the Tablet PC."

Ink in Office XP

Microsoft announced at Comdex 2001 that add-ins to support ink in Office XP 2002 (Word, PowerPoint and Outlook only) and Visio 2002 will be available at the same time as XP Tablet's release. In addition, handwritten notes taken in Microsoft's new Journal program will be able to be integrated with the contacts, calendar and task information in Outlook.

In his keynote speech, Gates demoed marking up a Word document with ink. In the Microsoft booth, members of the Tablet PC team demoed how ink might be integrated with Outlook. The demo showed how a user could respond to a text email by hitting a pen icon on the Outlook toolbar. The text portion of the email moved down, and an ink-entry box appeared above the text. The user could then scribble an ink response (with or without using handwriting recognition) and hit Send. The recipient would see the ink just as the sender had written it. This is a good example of "ink as a data type." The ink isn't attached to the email as a bitmap or a vector file, it's stored as data in the email the same way that text is stored in the email. Any graphic enhancement that the sender makes to the ink (such as bold or color) is stored as an ink property record.

Talking to XP Tablet

In the hundreds of pages of documentation in the XP Tablet SDK, only about four pages are devoted to Speech. XP Tablet will include the Microsoft Speech API, but the amount of attention being paid to it seems to be the minimum that will enable Microsoft to say that the Tablet PC supports speech recognition. The focus of the speech documentation in the SDK is on explaining to ISVs how to ensure that their Tablet PC applications can be controlled by voice (e.g., by saying "File – Page Setup – Landscape"). This is not exactly state-of-the art use of voice recognition. On the other hand, the use of commercial speech-recognition products such as IBM's ViaVoice on a Tablet PC should be no different than on an ultraportable laptop.

Further Testing

If the XP Tablet release cycle is consistent with that of other versions of Windows, there should be two more Beta versions, spaced three to four months apart. Beta-2 should therefore be released in the spring, and Beta-3 (traditionally the last Beta before Release to Manufacturing (RTM)) should be in the summer. Microsoft has made no formal announcements about this schedule, and as noted earlier, it could change substantially if a large number of Microsoft's developers are redirected into security-oriented activities. Microsoft has announced that there will be a Tablet PC "customer trial program" (called a Rapid Adopter Program, or RAP, in Microsoft-speak). This program will use sample units from several OEMs, Beta-2 or Beta-3 software (TBD), and is likely to take place during the summer.

HARDWARE

Hardware Requirements

Microsoft's Tablet PC Hardware Requirements (see

Q&A with Microsoft's Alex Loeb (by Conrad H. Blickenstorfer)

Following is a list of questions Pen Computing Magazine *posed to Alex Loeb, Vice President of Microsoft's Tablet PC division:*

PCM: Alex, here at Pen Computing Magazine *we have been following and covering the pen industry for almost ten years. Let me say upfront that we are very pleased with Microsoft's Tablet PC project. Microsoft's unwavering belief in the pen and pen tablets as an important future technology helped keeping pen technology alive after it was declared dead several years ago. Microsoft's own efforts in the pen arena, of course, have had their ups and downs, but it seems that your company clearly believes the time for the Tablet PC has come and that it is putting great effort into this project. We WANT for Microsoft to succeed with the Tablet PC and this is why we would like to ask you some tough questions. So let's get started:*

What exactly is the justification for the Tablet PC? Sure, it is nice to have the power of a full PC and all the features of Windows XP, but if portability and simplicity are issues, wouldn't people be better off with a lighter, simpler product such as a CE .NET-based slate?

Alex Loeb: There are literally tens of thousands of Windows applications today that our customers use and depend on to run their businesses. We need to enable our customers to continue to leverage the investment they have made in using those applications. In addition, we want to expand the capabilities of the PC to new scenarios, to enable it to support and run those applications in new places and in new ways. The Tablet PC, which incorporates pen-based technologies portable Windows PCs, does just that. And the combination of the Tablet PC form factor and pen based technologies enables new ways to use the PC - such as taking handwritten notes in meetings and annotating documents. In short, the Tablet PC makes it possible for people to use their PC in more aspects of their day without making any compromises since it is a full Windows XP PC and a pure superset of today's laptops.

PCM: I think Microsoft stated that Tablet PCs will be premium-priced products. We understand that the digitizer and pen add cost, but feel that this extra cost will work against Tablet PC acceptance. In the past, pen products failed in part due to the price premium of the pen. And the large price premium of Sony's pen-enabled Vaio Slimtop was listed as one of the reason for its failure. And high price was also cited as a reason for IBM's decision to kill the Transnote. Wouldn't it be better to just absorb that extra cost?

Alex Loeb: In terms of hardware pricing, that's up to each computer manufacturer. We would expect that Tablet PCs will be priced at approximately the same level as today's premium portable PCs. The pricing will undoubtedly vary according to the way the computer manufacturer chooses to equip their machines.

PCM: A pen is quite different from a mouse. Over a decade ago, Go realized that when they developed a totally pen-centric operating environment, PenPoint. In our opinion, subsequent efforts, including Windows for Pen Computing, failed in part because they simply added pen functionality to a mouse-centric OS. From what we have seen so far, the Tablet PC edition of Windows XP takes the same approach. Wouldn't it make more sense to create an interface designed from the ground up for the pen?

Alex Loeb: Again, I want to stress the investment that customers have made in the Windows operating system and Windows applications. Microsoft is deeply involved in the study of user interface design, and has spent a lot of time working with customers and learning from the extensive work that others in the industry have done. One key thing we've discovered is that people do not want to learn how to use a new OS with a new user interface, just as they do not want to learn new applications that are designed exclusively for pen-based input. Instead, users want to integrate their pen-specific tasks in a way that's consistent with their PC experience today. Thus, the OS for the Tablet PC builds on top of Windows XP Professional, which has been extended to support pen-based technologies without forcing any compromises. The goal with the Tablet PC is to provide a seamless experience for the user whether they are typing a memo at their desk, using a full keyboard and a mouse, or taking notes in a meeting room using a pen.

PCM: A pet peeve of ours here at Pen Computing Magazine *is that for every thousand dollars spent on hardware research and development, perhaps a couple of pennies are spent on the enabling technologies for pen products such as the Tablet PC. As a result, areas like handwriting recognition, ink processing, digitizers, etc. have seen very little progress over the past the years. Are you concerned about this, and do you think we'll see some more investment in those areas?*

Alex Loeb: The Tablet PC has been a vision for Microsoft and many in the industry for some time. I agree that realizing this vision has taken some time, in part since developing pen-based technologies - both on the hardware and software side - can be very difficult. While I can't speak for other companies, Microsoft has never stopped investing in pen technologies such as digital ink, handwriting recognition and display technologies like ClearType. In fact, over the course of the past ten years we have had so many people from across the company focused on the Tablet PC - from Microsoft Research, to the Office and Windows groups,
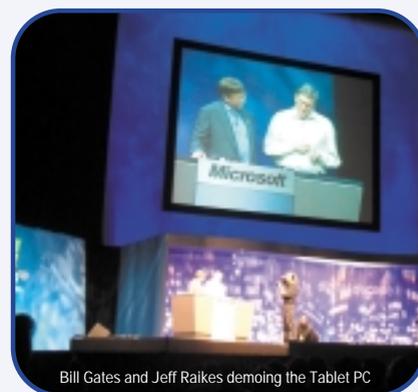
Bill Gates and Jeff Raikes demoing the Tablet PC

to our Developer Tools group - that our total financial commitment to-date is very difficult to quantify. We are optimistic that Tablet PCs will drive a renewed level of investment in pen-based technologies, and are very encouraged by the level of

response from computer manufacturers and software vendors.

PCM: The name Tablet PC implies, of course, a tablet or slate. Recently, we have seen more and more mention and emphasis on convertibles, standard notebooks with screens that rotate around and fold flat, or perhaps regular notebooks with a digitizer. We are afraid that this increasing emphasis on convertibles will relegate the actual tablet designs into a lesser role and result in the Tablet PC project degenerating into just a notebook add-on that people will reject because of the extra price. Your thoughts?

Alex Loeb: We expect that both the pure slate and the convertible form factors will be successful. Users will have a wide variety of machines to choose from, and will be able to select the model that is right for them, based on their particular needs. Each design has its own unique benefits - the slate offers users an ultra slim and lightweight design, and the ability to easily dock to gain access to a full keyboard and mouse. The convertible is slightly larger design, but offers immediate access to an attached keyboard. Regardless of the design, we wanted to give all users the benefit of the Tablet PC, whether their task is keyboard intensive or not.

PCM: With PC sales stagnating and notebook sales growth slowing, the industry is looking for the "next big thing." A Microsoft slide shown at a presentation in Taipei last December sized the total 2004 laptop market at 43 million units and set forth the assumption that Tablet PC may be 25% of those laptops plus 5% of desktops, resulting in a over 17 million (Tablet) PC opportunity. What are your projections for Tablet PC?

Alex Loeb: As with any new product, it's difficult to estimate exactly how quickly the Tablet PC will be adopted. We believe that many will see value in replacing their current laptops right away, while others will replace their laptops with Tablet PCs over the course of their company's normal replacement cycle. In the near term, we see a significant percentage of the ultra-portable market moving to the Tablet PC by the end of 2003. In the longer term, we see the majority of portable PC shipped to be Tablet PCs within 5 years.

PCM: Anything else you would like to add?

Alex Loeb: I'd like to reiterate that Microsoft is highly committed and invested in making the Tablet PC a success. We are continuing to work closely with our industry partners, and are excited to see the tremendous innovation that the Tablet PC is driving. In addition to compelling new hardware designs, we expect to see a whole host of new software applications based on the Tablet PC platform. We have released a complete software development kit with a rich set of development tools, and a number of key software developers have already begun to extend their application based on the Tablet PC. Microsoft, along with our partners, is looking forward to bringing the results of this work to market when we launch the Tablet PC later this year. ◆

http://www.microsoft.com/windowsxp/tabletpc/hardware.asp) are surprisingly simple. The requirements cover only five technologies: active digitizer, power management, screen rotation, docking and legacy ports, as follows:

ACTIVE DIGITIZER. All Tablet PCs must use an active digitizer with a resolution of at least 600 dpi, a data rate of at least 100 points per second, and an accuracy of 2 mm or better. These requirements are driven by two main needs: "mouseover" (hover) and high-quality inking. Refer to the July 2001 article for more information.

POWER MANAGEMENT. There are three separate requirements, as follows:

(1) A Tablet PC must resume from suspend in two seconds (this is about how long it takes someone to resume using a spiral-bound paper notebook).

(2) A Tablet PC must last for 72 hours in suspend (to ensure preservation of data).

(3) A Tablet PC must automatically enter hibernation if the battery becomes exhausted while in suspend (also to ensure preservation of data).

SCREEN ROTATION. A Tablet PC must be able to rotate the screen image between landscape and portrait modes at the touch a button (without rebooting). This allows the user to use whichever mode is appropriate (e.g., landscape for PowerPoint or portrait for Word) with zero effort.

DOCKING. A Tablet PC must support "Grab-and-Go Docking." This means that the Tablet PC must be able to be removed from a dock without warning, even if it's in the middle of writing a file to an external storage device such as an IEEE-1394 hard disk. As another example, if the Tablet PC is running an application in full-screen mode with a keyboard, the user must be able to remove it from the dock without warning

and then return the application to windowed mode using just a pen.

LEGACY-FREE. A Tablet PC must be legacy-free. It cannot have any external parallel, serial, PS/2, game or FDD ports, and the operating system must not see any of the standard hardware addresses (e.g., COM1) associated with those ports. The latter requirement disallows the proposed docking strategy in the July 2001 article that suggested bringing out legacy ports through a docking connector and simply omitting the connectors from the Tablet PC. The only allowable method of supporting legacy ports in a Tablet PC docking station is to convert them from USB or IEEE-1394.

Hardware Recommendations

Microsoft kept the list of hardware requirements very short in order to allow innovation by the OEMs. However, Microsoft has made a number of "hardware recommendations" that carry significant weight. They are as follows:

LCD RESOLUTION. The LCD should have a minimum resolution of XGA. An XGA Tablet PC in portrait mode provides 768 pixels horizontally, which is close to the minimum resolution in use for web browsing today (SVGA, at 800 pixels wide). XP Tablet's user interface will be optimized for a width of 768 pixels.

LCD DENSITY. The LCD should have a minimum density of 120 dots per inch (dpi). A 10.4" XGA LCD has 123 dpi, so this is seen as the optimum LCD for a Tablet PC. The LCD density recommendation is driven primarily by the need for high-quality inking. A 12.4" XGA LCD has only 106 dpi, which is technically below the minimum, but Microsoft has said that it's acceptable because there are

no other resolutions available in the 12.1″ size, and almost all ultraportable laptops use 12.1″ LCDs. Note that an 8.4″ SVGA LCD has 119 dpi, which is very close to the minimum, but in portrait mode it's only 600 pixels across, which will cause problems with XP Tablet's user interface.

HARDWARE BUTTONS. A Tablet PC should have a minimum of five programmable hardware buttons plus a sixth Function button. The buttons can be used for hardware functions such as adjusting backlight brightness, to produce keystrokes such as Backspace or Return, or to launch applications.

OTHER RECOMMENDATIONS. Microsoft's other recommendations can be grouped together under the general heading of "good ultraportable laptop design," as follows:

- High-performance CPU
- Good video performance in both landscape and portrait modes
- Long battery life (4 hours min)
- As thin as possible (0.7″ to 1″)
- As light as possible (under 3 lbs)
- Preferably no fan
- Wireless-enabled (good support for IEEE 802.11b)
- Sophisticated yet simple docking

Tablet PC LCDs

At WinHEC 2001 and the June 2001 Tablet PC conference, Microsoft strongly encouraged the OEMs to use a variety of LCDs sizes. However, during the last eight months, economics intervened. In order to use an active digitizer, a sensor grid (a 0.5-mm PCB) must be inserted between the LCD/backlight assembly and the LCD's driver electronics PCB. Inserting a grid into a standard LCD is a time-consuming, expensive and potentially damaging process. As an alternative, Toshiba decided to create a version of their standard 10.4″ XGA LCD which includes a "pocket" for the digitizer sensor grid. This makes it much easier for an OEM to assemble a Tablet PC. Consequently, more than 75% of the Tablet PC OEMs are using Toshiba's 10.4″ XGA LCD.

This means that there may not be as much product differentiation between Tablet PCs as Microsoft had hoped. The main differentiation may turn out to be form-factor (convertible versus pure tablet) rather than screen size. Most of the remaining 25% of the OEMs are planning to use 12.1″ LCDs, even in the absence of a pocket version. Since all but one of the ten ultraportable laptops currently on the market are 12.1″, there's a strong marketing argument for making a

12.1″ Tablet PC. One OEM is using an 8.4″ SVGA LCD, but as noted above, it may create user interface problems. None of the Tablet PC OEMs are using 13.3″ or 14.1″ LCDs because generally they're just too large and heavy for an arm-held portable product.

Transflective TFT LCDs are interesting to those OEMs who focus on vertical applications (such as Fujitsu), but most of the Tablet PC OEMs aren't going to use them. After all, there is only one mainstream laptop on the market today with a transflective screen (the NEC Versa DayLite), and it's rumored not to be selling very well. The obvious conclusion is that there still isn't any significant demand for outdoor readability in a laptop-class device. Microsoft's position on transflective TFT LCDs is that the current generation simply isn't bright enough indoors (in transmissive mode) to be acceptable.

Other Hardware

Eight months ago, only Transmeta was playing in the Tablet PC CPU game. By midsummer, both Intel and VIA had jumped in. Intel showed their Tablet PC reference design (using a Pentium III ULV CPU) at the Intel Development Forum (IDF) conference in August and at Comdex. VIA showed their reference design (using the

VIA C3 CPU) at Comdex. The majority of Tablet PCs will use Intel CPUs, a few will use Transmeta CPUs, and (so far) only VIA will use VIA's CPU. Those Tablet PCs using Transmeta represent good news for the beleaguered CPU vendor, who has so far been unable to land any design wins outside of the Japanese subnotebook market.

The video controller arena tells a similar story. Eight months ago, only Silicon Motion (SMI) of Taiwan was in the game, offering their Lynx-EM+ (2D) and Lynx-3DM (3D) video controllers. ATI jumped in during the summer with their current 3D MOBILITY RADEON laptop video controllers and a new rotation driver called "TabletVision," announced at Comdex. Portrait Displays has also jumped in with their Pivot rotation driver. The Tablet PCs will be split between SMI and ATI, with a third dark-horse video controller vendor appearing as a surprise. Rotation will similarly be split between SMI's driver, ATI's driver and Portrait Display's Pivot.

Finally, in the active digitizer space, FinePoint Innovations (finepointinnovations.com) and Wacom (wacom.com) are competing head-to-head for design wins in the Tablet PCs. Both vendors appear to be winning some. A few new Taiwanese digitizer vendors have entered

the game, but they don't appear to be able to meet Microsoft's specifications with their initial products.

What's Next

The next milestone in the long march of the Tablet PC from conception to shipping product are the CeBIT show (held in March in Hannover, Germany) and the TECHXNY show (formerly PC Expo, held June 25-27 in New York City). Nearly all of the Taiwanese OEM/ODMs will have prototype hardware on display at CeBIT, and some of the unannounced OEMs may choose TECHXNY as the forum to announce their Tablet PC products.

Looking back over the last eight months, while the program has moved forward substantially, nothing much has changed from the viewpoint of risk. Most of the risks I identified in the July 2001 article are still present, as follows:

• Significant possibility of low initial market demand and/or product acceptance
• Resistance to "a laptop without a keyboard" (for the pure tablet OEMs)
• Inadequate docking solutions
• Insufficiently differentiated products
• Steep learning curve for OEMs and ODMs who have never built a pen computer
• Microsoft may not get the details of the user interface right the first time
• Handwriting recognition may not be good enough
• Possibility of insufficient Windows application compatibility
• XP Tablet 1.0 may be a typical "Version 1" Microsoft product

In the July 2001 article on Tablet PCs in Pen Computing Magazine, I estimated the probability of Version 1 of the Tablet PC crashing and burning at 50%. Eight months later, my estimate of the probability of a real crash and burn (i.e., total market rejection of the Tablet PC) has decreased quite a bit due to the presence of convertibles. However, the probability of selling substantially less than the predicted 500,000 to a million first year volume still seems to be at least 50%. It's a high-risk poker game, and OEM/ODM players without deep pockets and substantial staying power may have to drop out before the second round.

Based in Silicon Valley, Geoff Walker is a consultant with Walker Mobile, LLC. Geoff has worked on the engineering and marketing of pen computers since 1989 at GRiD Systems, Fujitsu Personal Systems (now Fujitsu PC) and Handspring. He can be contacted at geoff.walker@att.net.

Introducing Microsoft's "Mira"

"Mira" is a new wireless monitor technology announced by Bill Gates in his keynote speech at the Consumer Electronics Show (CES) in Las Vegas on January 7, 2002. The basic concept is an "intelligent display" (a wireless monitor) that can be removed from its base and used around the house while still connected wirelessly to the PC. This is a home entertainment device, not a computing device. Imagine watching a movie playing from a DVD on the PC, playing a game or viewing snapshots on Mira, all while you're sitting on the couch. Mira looks like a large Tablet PC.

The core of the intelligent display is a standard monitor-sized LCD (15 to 18 inches), driven by a National Semiconductor Geode processor running CE.Net (see the article on CE.Net in this issue for more information on this new OS). Mira is battery-powered. The remote connection to the PC is made physically via IEEE 802.11b wireless LAN, and logically via Microsoft's RDP (Remote Desktop Protocol). When Mira is in its desktop monitor stand, the connection to the PC is made via a standard monitor cable. The human interface on Mira is a touch panel (passive resistive digitizer). Touch is acceptable in this application (versus the active digitizer that's required in a Tablet PC) because Mira isn't intended to be used for input-intensive tasks such as taking notes in a meeting. It's a home entertainment device – input will typically be a few taps here and there. In essence, Mira is a portable, pen-based "thin client," connected to a home PC as the server. The table below compares Mira to Tablet PCs, pen tablets, CE tablets, webpads and thin clients. (See the "Tablet Taxonomy" in the January issue of Pen Computing for more information about how to classify pen tablet devices.)

Mira isn't new technology. Everything in it has been around for at least a few years. It's a classic Microsoft product: existing technology that's nicely packaged, well-positioned with strong marketing spin, and defined as a platform on which OEMs, IHVs and ISVs can develop products. It's a reasonable step forward in Microsoft's latest effort to make the PC the center of home entertainment.

SPEC	MIRA	TABLET PC	PEN TABLET	CE TABLET	WEBPAD	THIN CLIENT
PC	No	Yes	Yes	No	No	No
Operating System	CE.Net with RDP	XP Tablet	XP, 2000, NT, 9X	CE 3.0	CE 3.0, Linux or QNX	CE 3.0 with RDP or ICA
CPU	NS Geode	Pentium III	Pentium III	StrongARM or NS Geode	StrongARM or NS Geode	StrongARM
Display	15"-18" LCD	10.4"-12.1" LCD	8.4"-13.3" LCD	5.5"-8.4" LCD	8.4"-10.4" LCD	Various LCD & CRT
Digitizer	Touch	Active	Touch	Touch	Touch	None
User Interface	Any Windows application	Any Windows application	Vertical Windows application	Vertical CE applications	Web browser	Server Windows
Local Applications	Not yet	Yes	Yes	Yes	No	No
Connection	Home PC	Anything	Anything	Anything	Internet	Server
Wireless	Integrated WLAN (802.11b)	WLAN (802.11b) via PC card	Integrated WLAN & WAN	WLAN and WAN via PC card	Integrated WLAN (802.11b)	No