RAMON CASADESUS-MASANELL

KEVIN BOUDREAU

JORDAN MITCHELL

Palm (A): The Debate on Licensing Palm's OS (1997)

Shortly after the acquisition of Palm's parent US Robotics by 3Com in February 1997, 3Com's CEO, Eric Benhamou, began applying pressure on Palm executives to open up the Palm OS (operating system) to other handheld computer manufacturers. Benhamou pointed to the PC (personal computer) market as evidence that opening up a platform to other firms spurred on hardware development, grew the size of the market and ensured the dominance of one operating system. Specifically, Apple was trotted out as an example of losing out to Microsoft by refusing to license out the Mac OS operating system to other manufacturers such as Hewlett-Packard (HP), Compaq and Dell.

Some of the popular press had even proclaimed the downright demise of Apple; *Business Week* had declared, "The death of an American icon," on a cover story about Apple in 1996. In contrast, Microsoft Windows had grown to control over 90 per cent of all OSs on PCs by forming broad licensing agreements with original equipment manufacturers (OEMs). 3Com executives were adamant that Palm's future should not follow Apple's downfall in the PC market. The message from 3Com was clear: "[Palm should] license early and license broadly, before Microsoft takes [the] market away."[1]

Palm's co-founders – Jeff Hawkins (Product Technology) and Donna Dubinsky (CEO) – argued fervently against Benhamou and 3Com executives. Hawkins and Dubinsky claimed that the market for handhelds was distinct to the PC market. They defended their position of not opening up the Palm OS for license immediately by contending that Palm would be fighting against other manufacturers for a small group of potential customers in the relatively immature handheld computing market.[2] This argument gave more fuel to Benhamou's position; he was sure that by extending the platform to other manufacturers, the entire market would blossom. Over 1.6 million handheld computers were shipped worldwide in 1996 and some estimates pegged the market at 10 million units by the year 2000. Benhamou wanted an action plan from Dubinsky and Hawkins by the end of February for potential Palm OS customers. Benhamou wanted big name manufacturers that would propel the market to new heights and stave off competition from other OSs such as Microsoft's Windows CE and Psion's EPOC. (See **Exhibit 1** for market shares).

The demand weighed heavily on Dubinsky and Hawkins. They wanted the freedom to plot the course for the company and felt that licensing now would seriously affect Palm's future. Even though Palm was a small company amongst an industry of giants, they had been responsible for the highly successful Palm device, which currently held 74 per cent of domestic market share and 51 per cent of

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the worldwide market. If Palm were to open up the platform in the relatively young market, concerns were that Palm may be left playing "second fiddle" to the industry giants. Furthermore, Palm had had substantial problems in the past when it partnered with major companies. What was the right course of action for the five-year-old company? Should it make its platform available to other major manufacturers for hardware development? What was the right thing to do?

The Evolution of Handheld Computing

The Beginning

Handheld computing had its roots in the 1980s as computing and electronics companies looked to release products with increased portability. Two extremes emerged: laptop computers with similar functionality as desktop PCs (albeit, usually with less memory) and electronic organizers that acted as personal agendas and address books. While a number of different firms – both big and small – were experimenting with hand-held computing, a small UK firm, Psion, found some early commercial success; in 1984, Psion released the Psion Organiser, priced at £99 ($200).[3] The unit had an alphabetic keyboard and was a little bit larger than a pack of cigarettes at 5.5 x 3.5 inches. It included 2K of RAM, 4K of applications in ROM.[4] The idea was to provide a portable machine that would have the ability to retain data. Psion offered additional packs, which included a programming language (OPL – Organiser Programming Language) as well as mathematical and financial functions.

Entry intensified by the late 1990s both with DOS clone devices by HP and Compaq and advanced electronic organizers such as Sharp's Zaurus and Casio's BOSS. By the end of 1991, Sharp and Casio led the market for electronic organizers having sold over one million combined during the year.[5] All of the products had been designed and released without involvement from outside firms. Each firm was seen to take an integrated approach to the development in a number of ways: the device design benefited from shared code across the operating system and application; the component drivers were designed specifically for the hardware; code was pre-installed in the system memory; and, knowledge from other electronics products within each company had been passed to the development team.

During the early 1990s, the focus began to shift from electronic organizers and DOS portable machines to more sophisticated 16-bit systems with a specific focus on pen-based computing, which was heralded by the popular press as the next "big thing."[6] It was estimated that up until the early 1990s, $100 million had been poured into hopeful pen computing start-ups. Prominent companies focused on pen-based computing included GO Corporation, Microsoft (with MS-DOS as the OS for pen-based machines), Momenta and GRiD, a subsidiary of Tandy. The latter was the first company to have a commercially available pen-based computing product – the GRiDPad, released in 1989. The GRiDPad weighed 4.5 pounds, cost $2,500 and was targeted to the corporate market.[7]

While many lauded pen-based systems as the wave that would put computing in the hands of the lay, others criticized the fact that scant applications existed for the machine. One journalist at *PC Magazine* chided:

> [Momenta's sales pitch] goes like this: there aren't any real pen-PC applications out there yet, so in the meantime you can use the machine with its keyboard, just as you would any notebook PC. Then, when pen apps become available, you can switch over to using it as a stylus-entry machine. C'mon, guys: Focus!...the market isn't asking for a Swiss Army knife job. There are lots of other things wrong with the Momenta. It has an innovative, squirrelly, confusing, and hard-to-navigate proprietary operating system yep, another kiss of death: the proprietary operating system.[8]

In general, onlookers talked about the technological barriers in releasing a reliable pen-based handheld computer. One expert stated: "You need two things from the microprocessor [for portable

devices], low power usage and high performance in order to make the interface feel like real pen and paper. The 386^9-level is just not enough."[10]

Efforts to Co-develop Handheld Computers by Industry Leaders

Several large electronics enterprises, computing companies and venture capital firms formed alliances to further the development of 16-bit handheld computers. Among them, IBM had financially backed the young start-up GO Corporation in the late 1980s to develop PenPoint, a pen-based OS. However, negotiations to secure financial backing went on at length which slowed the process; as Jerry Kaplan, GO Corporation's co-founder said, "Rather than empowering the responsible party to make a deal, IBM assigns a professional negotiator, who usually knows or cares little for the substance of the agreement but has absolute authority over all of its details."[11]

GO Corporation then partnered with AT&T, although that partnership ended due to mistrust, time delays in meeting targets and disagreements on the product development. Shortly thereafter, IBM, having released the pen-based ThinkPad running on GO Corporation's PenPoint OS earlier, also set its sights on developing a handheld computer with phone capabilities. It worked with BellSouth to develop Simon, a cell phone-come-handheld computer. However, the device was seen to be too heavy and was ineffective in administering phone calls and computing functions at the same time.[12]

In a separate project that followed shortly thereafter, Apple, Sony, Motorola, Philips, AT&T and other companies set out to develop a common operating system platform for handheld computers based on General Magic's "Magic Cap" platform. Initially, General Magic was seen as a strong potential up-and-comer with many predicting that it would release a sure-fire successful product. But, when products running the Magic Cap OS hit the market, they were received poorly by consumers. One designer who took part in designing the chips for handheld devices running Magic Cap stated:

> Different people buy different devices for different reasons and have different usage patterns. These are all very different markets to exploit. You might have a single OS that spans all of them, but to say you will have a single design or a single device that spans them all is not reasonable.[13]

Predicting consumer uses caused several disparate visions of the sponsoring companies. For example, some companies wanted to make the device more focused on communication with wireless capabilities, while others focused on the novelty of a pen-operated device. Others envisioned the device to be a miniaturized version of desktop and laptop operating environments.

One observer likened these early handheld computing partnerships to the elusive rock'n'roll dream:

> It's kind of like a rock-and-roll group. You get five guys and they all start off with the same goal, but sooner or later somebody wants to do his own thing. Competition [within the alliance] can make things difficult, and sometimes whatever they're rallying around doesn't prove to be what they thought it was going to be.[14]

Apple's Newton

In this period of diverging opinions on what these devices should do, Apple's CEO, John Sculley, came out with a vision for his own company to pursue: the development of the company's own handheld device. By bringing almost all of the development under the company's control, the plan was that Apple would be able to dominate the market; in 1992, Apple's CEO, John Sculley, had predicted a trillion dollar future market for pen-based handheld computers, or what he dubbed, personal digital assistants (PDAs).[15] PDAs were distinct from former portable organizers in that they included handwriting recognition with an electronic pen. Later in the year, Apple made a media

splash by announcing its plans to release the Newton, a PDA that recognized cursive handwriting. By the late summer of 1993, Apple's Newton hit the market and within a number of weeks sold 40,000 units to early adopters.

Despite the initial excitement in the marketplace, the Newton release quickly turned sour. People complained that Apple had promised too much since the device could not effectively read user's handwriting. An article in *PC Week* stated, "the Newton is almost worthless…basically, shelfware. After three weeks, it still couldn't consistently differentiate my 1's from my t's."[16]

Apple had invested over $200 million into the Newton and after two years on the market, sales totaled 140,000 units.[17] While many spectators were critical of the device, the Newton was regarded by many experts to be a landmark in handheld computing and handwriting recognition.

Tandy (and Palm's) Zoomer

In January 1992, with support from venture capitalists and GRiD's parent, Tandy Corporation, Jeff Hawkins established Palm Computing. Hawkins had been responsible for the development of the tablet computer GRiDPad in his role at GRiD Systems. Hawkins believed that a device such as the GRiDPad, albeit smaller and cheaper, would appeal to the consumer market. Rhyming with the word "consumer," the name "Zoomer" was given to the project. Tandy and Casio were tapped as manufacturing and distribution partners and GeoWorks' GEOS was chosen as the operating system. Under the arrangement, Palm would write the software applications such as an agenda, to-do list and address book. Palm agreed to have the product ready in 11 months and in order to meet the commitment, the company took on a number of engineers and hired former Apple and well-known Silicon Valley executive Donna Dubinsky as CEO.

Working with the partners was fraught with difficulties as Casio and Tandy demanded that more features be added during the development. When Intuit and America Online (AOL) joined the project, development meetings stretched on for days in what was known as "board room engineering" – an executive from Casio stated: "Everything and the kitchen sink had to be in the product."[18] The "feature creep" led to delays and disagreements in the final product. The disagreements arose from fundamentally different visions of how the market for handheld devices would progress. Some members emphasized the need for more applications while others pushed for lighter weight and smaller size.

In October 1993, the product was released as the Zoomer (by Tandy) and the Z-7000 (by Casio) for $700 per unit at retail. The product weighed one pound and was the size of a paperback novel. The release of both products was on the heels of Apple's struggles with the Newton; Palm executives believed that the Newton had disenchanted consumers' taste for PDAs. Sales were far below expectations reaching only 20,000 units in the first two months. Observers believed that Zoomer's failure was due to "its sluggishness, inconvenient size and weight, poor handwriting recognition software and steep price."[19]

Microsoft's WinPad Project and Psion's Success with Series 3

Seeing the activity in handheld computing with its DOS OS, Microsoft deliberately decided to follow its own approach with an original vision to unify OSs across a wide range of devices (both desktop and handheld computers). Commencing the WinPad project in 1992, Microsoft hoped to advance its position in pen computing. Microsoft involved a number of firms such as Compaq, Toshiba, Motorola, NEC and Sharp. During the development phase, the product manager for Toshiba stated that a major challenge was managing user perceptions of the device's functionality: "Microsoft sees this [early version] as basically a view-only device, and we are working with that."[20] By 1994, the companies abandoned the project before it hit the market as it was felt that it was not commercially viable due to insufficient processing power for hand recognition technology and the necessary battery strength to power the device. Around the same time, another internal Microsoft project

codenamed Pulsar was in process. The directive was to create a wireless, consumer device, or as some described, "a pager on steroids." However, the project was scrapped after negative feedback from consumer panels.

Throughout this time, the market for handheld computers (not counting electronic organizers), remained relatively small (in the hundreds of thousands) of unit sales per year. Psion, the small UK upstart, had remained in the lead with its Series 3 (released in 1991) and Series 3a (released in 1993) handhelds. Psion developed both devices and their corresponding OSs entirely in-house with little collaboration from outside firms.

A New Direction for Palm

After the Zoomer product flop, Palm and GeoWorks immediately set to work trying to improve the speed for a Zoomer II. However, Casio and Tandy were not interested in marketing another Zoomer product, leaving Palm to consider a new direction. Palm executives concluded: "without platforms, we wouldn't be able to sell applications. So, we decided to try to fix the system-wide problems that plagued the PDA in the marketplace."[21] Palm decided to shift its efforts to write software that would allow greater connectivity between non-pen based PDAs made by HP and Psion to desktop PCs. However, Psion opted to write their own connectivity package and HP's interest waded in "luke warm" waters.[22]

During this time, Palm was working on its Graffiti technology, which differed from other handwriting recognition software in that it only recognized specific characters. The technology required that users would need to learn specific writing. For example, a "T" was similar to a "7". One Palm insider stated: "Everyone in the industry thought we were crazy [to have users adapt to the product]."[23] Hawkins, however, believed that consumers would be willing to learn as long as the payback was sufficient. The Graffiti software permitted Palm to reduce the processing power and dedicate only a small corner of the screen to handwriting entry as letters could be placed on top of one another.

Palm goes for the "Touchdown"

Hawkins was convinced that companies manufacturing PDAs at the time were too focused on adding extra features instead of developing a simple tool that did not compromise on the quality of any of its components. In fact, he believed that other PDAs were hurting Palm's prospects by not having the right devices in the marketplace.[24] Against what many in the company believed to be a "crazy plan" to begin manufacturing hardware, Hawkins, Dubinsky and Palm set out to design Palm's own device, codenamed, "Touchdown."[25]

The design directive was that the device would be compact enough to be carried in a standard shirt pocket, and would be simple, fast and expandable.[26] The price was targeted to be cheaper than $300 at retail. Palm determined that the product would be an accessory to the PC instead of mimicking the functionality of a PC (previous PDAs had attempted to offer a miniature version of a PC). The internal development team was made up of 25 people and the total development budget was approved at $3 million.[27] Palm involved an industrial design firm to develop the form factor of the product. During the development of the Touchdown, the company turned away deals from hardware partners including Motorola, Compaq and Tandy that took away control of the design process, intellectual property and sales distribution rights. However, with mounting cash problems, Palm could not manufacture the product without more financial resources. Palm's management team approved the takeover by US Robotics in September 1995, on the condition that Hawkins and Dubinsky, could remain in control of Palm and continue with their plans for the Touchdown. Being part of US Robotics gave Palm access to modem technology, U.S. manufacturing sites and contacts with nationwide retail stores.

Touchdown becomes the Pilot

In the lead-up to the launch in April 1996, the team agreed on the name, Pilot. Palm executives traveled across the U.S. to personally meet with editors and computing influencers to introduce the devices dubbed as the "the connected organizer." Two models of the Pilot – 1000 for the personal market and 5000 for the professional market – launched with rave reviews. The personal device had a 16MHz DragonBall processor (made by Motorola), 128K RAM, screen resolution of 160x160 pixels, weight of 5.5 ounces and size of 4.7 x 3.2 x 0.7 inches. Palm's controlled sales strategy of selling through carefully selected retailers yielded sales of 100,000 units in the first few months. Many analysts heralded the Pilot as defining a new standard for handheld computing in that the devices were priced reasonably at $299 and worked seamlessly with the desktop PC. Before the Pilot was launched, work on the second version of the device commenced. Called the PalmPilot, the device offered a backlit screen and an upgraded calendar and address book. The PalmPilot, run off the second version of Palm OS, had the same hardware specifications as the first generation Pilot with the exception of more memory (512K for personal devices and 1024K for the professional market).

To encourage adoption, Palm released software development kits (SDK) to software developers to create applications for PalmPilots. Palm targeted larger software development companies but after a tepid response, Palm chose to focus on hobby programmers and smaller development companies.[28] Immediately, a number of shareware applications (programs made available for free or on an honor system of paying for the license) became available; two days after the SDK was released, a version of the arcade game Space Invaders was posted on the Internet for PalmPilots.[29] Eventually, consumers demanded more Palm applications and larger software enterprises like Lotus and Symantec began developing Palm software.[30] By the end of 1996, over 100 software applications had been released and over 1,000 developers had purchased PalmPilot SDKs.[31] (See **Exhibit 2** for Palm's 1996 financials).

Having released three major handheld devices since its establishment five years earlier, Palm held 51 per cent worldwide share of PDAs.[32] Many predicted that the company would break the millionth unit mark in unit sales by the end of 1997, which would make it the fastest time in which a computer hardware product had surpassed the ominous millionth unit level. However, Microsoft was hotly pursuing Palm's leadership with the goal to become the standard operating system in handhelds just as they had done in PCs.

Microsoft's Entry into Handheld Computing

After previous internal Microsoft initiatives (WinPad and Pulsar) were terminated, the teams came together to form Pegasus.[33] The Pegasus team integrated some of the ideas from the former WinPad project and adopted a 32-bit code previously developed in the Pulsar project to create a new operating system. The team created and submitted specifications for hardware to seven hardware partners including Casio, Compaq, HP, LG Electronics, Hitachi, NEC and Philips.[34] Amongst the requirements were the size (not to surpass 7 x 4 x 1 inches), the power (to be supplied by two AA batteries), the weight (less than 1 pound), the screen (an LCD touch screen), and memory (minimum of 4MB of ROM and 2MB of RAM).[35] Microsoft wanted the device to work across several regions and in any language.[36]

In late 1996, the first handheld computers by NEC and Casio operating Windows CE 1.0 hit the market. Up until February 1997, other models from the remaining manufacturers were planning their product launches. Microsoft and its partners marketed the devices as "PC Companion" as the device sizes were too big to be considered "pocketable."[37] HP changed some of the hardware specifications on their own release (the 300LX) in order to provide greater screen resolution and size (640x240 instead of 480x240) and marketed the product as a "Palmtop PC."[38] Thus far, the larger screen size was proving to be popular with consumers and technology observers suggested that the larger screen size would likely become the norm for handheld computers running Windows CE.[39]

The first Windows CE operating system had problems synchronizing with the newly released Microsoft Office 97 version. Additionally, Microsoft reportedly did not offer sufficient support for the

operating system's email functionality. As one observer stated, "Microsoft's resolute attempt to intertwine the handheld PC with Outlook as an attempt to encourage adoption undoubtedly did more damage to the release of both product lines than good."[40]

Along with the first release of Windows CE, Microsoft offered an SDK. In order to develop applications for the Windows CE operating system, developers required expensive software (Visual Studio 97, Visual Basic 5 and Visual C++) and additional modules from Microsoft.[41] Over 90 third-party software developers had adopted Windows CE as their platform.[42]

The Intensifying Environment as of early 1997

As of early 1997, two major changes were afoot in the competitive context: Microsoft was planning a follow-up with the release of CE 2.0 later in 1997, and Psion, which had experienced great success with its Series 3 handheld computers, was about to move into mobile phones.

Industry observers predicted that Microsoft CE 2.0 would offer significant benefits over current handheld OSs as it was expected to add support for color screens, a number of different screen sizes, networking capabilities and the ability to run off of low-powered microprocessors.[43] It was viewed to be substantially different as it was based on modules wherein OEMs could use parts of the platform as the basis for a device. For example, several companies used part of Windows CE 2.0 in devices outside of the handheld computer realm including products like ATMs, automobiles, game consoles and cooking utensils.[44]

Windows CE 2.0 was also expected to mimic the operating environment of a Windows 95 PC operating environment. (Windows 95 was considered to be Microsoft's most successful OS to date as it held over 90 per cent market share in the PC OS market). For example, Windows CE 2.0 was likely to come equipped with applications like Explorer, Word, Excel, Outlook and PowerPoint.[45] Along with the ability to operate PC-desktop applications, the handheld computers would be able to store more and run complex applications such as video media.[46] The system supported True Type Font display, which was directed at improving screen clarity.[47] Another planned benefit of Windows CE 2.0 was regarded to be its ability to communicate with a wide range of external devices such as network adapters, modems, GSM and cellular telecommunication connections and wireless networking.[48] Microsoft hoped that handheld computers running Windows CE 2.0 would become the device of choice for the "business person on the move."

During this time, Psion's own market share began to plummet and this once strong industry leader was struggling to find a way to compete against Palm. Central to its strategy was to open its fifth generation 32-bit platform, Series 5, expected in the summer of 1997. The company also decided that it would focus on the mobile phone market as the recent adoption of the GSM standard was expected to foster greater convergence between communications and computing. Finnish mobile phone giant Nokia had previously released a communicator, which combined a GSM phone with the GEOS operating system from GeoWorks. Psion's decision emerged from deliberations and constant questioning by a British journalist in the mid-1990s: "Are you going to die like Apple [or] like IBM?"[49] At the time, observers believed Apple and IBM's days were limited because Apple had not licensed the Macintosh OS to outside firms and IBM had ignored the PC.[50] From the beginning of the development process, Psion had planned on licensing its EPOC OS to outside firms. In mid-1996, Psion took efforts to restructure itself into different divisions including Computers, Enterprise and Software. The Software division was oriented towards licensing EPOC to outside companies. (See **Exhibit 3** for the major product releases of Psion, Microsoft and Palm).

Market experts believed that later in the year, the market for handheld computing devices would sender into new segments. Some analysts predicted that within the business consumer group, two types of end users would emerge – standard PDA users and individuals seeking a laptop replacement.[51] Others believed that other handheld devices would inevitably converge with cellular and mobile phones.

Should Palm Open its Platform by Licensing it OS?

Amidst the shifting competitive context such as the threat of Windows CE 2.0 looming later in the year and Psion beginning to open its platform to other phone manufacturers, the debate raged on between Palm and 3Com as to whether it platform should be licensed. The proposal by 3Com management was to allow other companies to build devices compatible to the Palm OS in exchange for the payment of royalty on each unit sold. By instigating the strategy, 3Com believed that handheld devices running the Palm OS would be able to reach a much broader market than Palm could reach on its own. In turn, it would solidify Palm OS as the leader and attract software developers to create Palm OS applications.[52] 3Com's CEO, Eric Benhamou was a strong proponent of licensing out Palm's OS to other device manufacturers. He stated:

> This [has been] clearly a point where we had fundamental business disagreements. Jeff [Hawkins] and Donna [Dubinsky] [think] about their business as primarily a device business. I [think] that if this was all they were going to do, it [is] going to be far short of the potential of that business. And I [can't] conceive of a device business that would really, really change the face of computing. We [have] to create an OS business.[53]

Dubinsky and Hawkins believed licensing the Palm OS right away would only stifle Palm's attempts to be the market leader. Furthermore, by having more entrants manufacturing Palm OS devices, Palm's income would be reduced, thereby stripping away opportunities to invest in future technologies.[54] As far as Dubinsky was concerned, the timing of licensing the platform was crucial. She stated, "Licensing will come later. Today it certainly won't add value. What *will* add value today is investing in product development, getting the next generation and the next generation out, advancing the category, and building intellectual property."[55]

Who was right? Would it be best for Palm to license their OS and actively try to become the "Windows of the handheld world?" If not now, when? Perhaps the window of opportunity to become the dominant platform was quickly closing.

Exhibit 1 Market Share

Shipments and Market Share Estimates of Mobile Computers (Units)

	Units		Market Share	
	1995	**1996**	**1995**	**1996**
Standard Handheld				
Palm/US Robotics	-	360,226	0.00%	51.45%
Hewlett-Packard	164,465	181,267	43.12%	25.89%
Apple Computer	87,574	63,449	22.96%	9.06%
Casio	11,461	19,262	3.00%	2.75%
Sony	27,265	16,154	7.15%	2.31%
Itronix	9,933	7,966	2.60%	1.14%
Prolinear Corp.	9,883	6,933	2.59%	0.99%
Compaq Computer Corp	-	5,735	0.00%	0.82%
Abstract Research and Development	5,590	3,435	1.47%	0.49%
NEC	-	2,514	0.00%	0.36%
Epson	1,078	1,779	0.28%	0.25%
Badger Computers	2,994	1,520	0.78%	0.22%
Motorola Computer Systems	2,599	658	0.68%	0.09%
Omnidata International	334	193	0.09%	0.03%
Fujitsu	27,492	-	7.21%	0.00%
IBM	4,519	-	1.18%	0.00%
Sharp	2,054	-	0.54%	0.00%
Other Handheld Vendors	24,163	29,004	6.34%	4.14%
Subtotal	**381,404**	**700,095**	**100.00%**	**100.00%**
Total Revenues ($ in Millions)	**267.6**	**307.8**		
Average Revenues/Unit	701.62	439.65		

	Units		Market Share	
Expandable Organizer				
Sharp	477,659	413,176	61.72%	51.74%
Psion	278,783	380,827	36.02%	47.69%
Casio	17,519	-	2.26%	0.00%
Other Handheld Vendors	-	4,518	0.00%	0.57%
Subtotal	**773,961**	**798,521**	**100.00%**	**100.00%**
Total Revenues ($ in Millions)	**236.1**	**278.8**		
Average Revenues/Unit	**305.05**	**349.15**		

Source: Dataquest Mobile Computing Worldwide Marketplace Analysis, First Quarter 1997 as quoted in
Rajesh Atluru, Kevin Wasserstein, Thomas Kosnik, Palm Computing, HBS Case, 9-559-040, December 15, 1998

Exhibit 2 Palm Financials

Financial Measures

USD$ thousands	1996
year ending in May	

PALM	
Revenue	7,054
Cost of Revenues	4,479
Gross Margin	2,575
Gross Margin %	36.5%
Operating Income	-6,777
Net Income	-3,062

Source: Taken from Annual Report 2000, 10-K.

	1993	1996	1997E

PALM

		Zoomer	Pilot	PalmPilot
Processor Speed (MHz)		20MHz	16MHz	16MHz
RAM		1 MB	128K-512K	512K-1024K
Screen Resolution (pixels)		320 x 256	160x160	160x160
Weight (ounces)		16 ounces	5.5 ounces	6 ounces
Size (inches) - H x W x D		6.8 x 4.2 x 1	4.7 x 3.2 x .7	4.7 x 3.2 x 0.7
Price ($)		$700	$299-$369	$299-$369

PSION

		Series 3a	Series 3c and Siena	Series 5 and EPOC
Processor Speed (MHz)		7.7 MHz	7.7 MHz	18.4 MHz
RAM		1MB	1MB	8MB
Screen Resolution (pixels)		480 x 160	480 x 160	640x240
Weight (ounces)		9.7 ounces	9.7 ounces	12.5 ounces
Size (inches)		3.5 x 6.3 x .9 inches	3.5 x 6.5 x .9 inches	3.5 x 6.7 x 0.5 inches
Price ($)		aprox. $600	aprox. $600	$699

WINDOWS CE

			Windows CE 1.0 (i.e., Casio A-10)	Windows CE 2.0 - Planned
		NO PRODUCT RELEASED		PRODUCT DETAILS UNKNOWN
Processor Speed (MHz)			44 MHz	
RAM			2 MB	
Screen Resolution (pixels)			480 x 240	
Weight (ounces)			13.4 ounces	
Size (inches)			3.2 x 6.9 x .9 inches	
Price ($)			aprox. $700	

Source: Compiled by case writer.

Exhibit 3 Product Releases

Endnotes

[1] Andrea Butter and David Pogue, "Piloting Palm," New York: John Wiley & Sons, Inc., 2002, p. 194.

[2] Kenneth S. Corts and Deborah Freier, "The Rise and Fall (?) of Palm Computing in Handheld Operating Systems, Harvard Business Case, 9-703-519, June 24, 2003, p. 3.

[3] Steve Litchfield, "The History of Psion," 2005, http://3lib.ukonline.co.uk/historyofpsion.htm, Accessed March 8, 2007.

[4] Ibid.

[5] Rajesh Atluru, Kevin Wasserstein, Thomas J. Kosnik, "Palm Computing: The Pilot Organizer," Harvard Business Case, 9-599-040, p. 2.

[6] 16-bit refers to either hardware or software that can transfer 16-bits of data at a time. 16-bit devices and software were a major stepping stone in the early-1990s to achieve faster processing times.

[7] Andrea Butter and David Pogue, "Piloting Palm," New York: John Wiley & Sons, Inc., 2002, pp. 7-8.

[8] Jim Seymour, "Momenta Corp's Pen-based Computer Lacks Focus," PC Magazine, January 28, 1992, p. 99.

[9] 386 refers to the predominant microprocessor in 1993 and 1994 for PCs.

[10] Dwight B. Davis, "Turmoil in pen operating systems. (no single operating system has emerged for integrating pen-based computers into enterprise networks)," Datamation, December 15, 1993, Vol. 39, No. 24, ISSN: 0011-6963, p. 20.

[11] Jerry Kaplan, "Startup: A Silicon Valley Adventure," Middlesex, UK: Penguin, 1994, p. 120.

[12] W. David Gardner & Rick Boyd-Merritt, "It's Alive -- New services and concepts re-animate the handheld," OEM Magazine, October 1, 1995, Issue: 321, p. 72.

[13] W. David Gardner & Rick Boyd-Merritt, "It's Alive -- New services and concepts re-animate the handheld," OEM Magazine, October 1, 1995, Issue: 321, p. 72.

[14] Caroline A. Duffy, "Alliances form to build PDA capabilities," PC Week, April 19, 1993, p. 32.

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