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PDA Market Report:

Global Sales, Usage and Trends

April 2002

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Welcome to eMarketer

Dear Reader:

Welcome to the *PDA Market Report: Global Sales, Usage and Trends*™, eMarketer's coverage of the global market for personal digital assistants and convergent handheld devices.

The *PDA Market Report: Global Sales, Usage and Trends*™ looks at the growth of the PDA market throughout the world, and considers the prospects for future sales of PDA devices in North America, Europe, Asia and Latin America. It also examines the enterprise market for handheld devices, and general usage patterns of internet and wireless device users.

This report will be of interest to technology vendors, industry analysts, and enterprise buyers who may be interested in the broad trends shaping the PDA market. Consumer products vendors, online marketers, and website operators will also be interested in the *PDA Market Report: Global Sales, Usage and Trends*™, as it provides essential numbers behind the growing market for mobile device users with wireless access to the internet.

If you have any questions or comments concerning eMarketer or any of the material in this report, please call, fax or e-mail us.

Andrew Raff,
Analyst

Written by Andrew Raff

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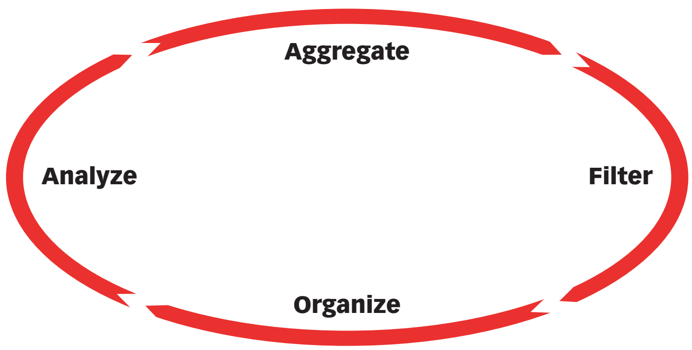
eMarketer's approach to market research is founded on a philosophy of aggregating data from as many different sources as possible. Why? Because there is no such thing as a perfect research study and no single research source can have all the answers. Moreover, a careful evaluation and weighting of multiple sources will inevitably yield a more accurate picture than any single source could possibly provide.

The eMarketer Difference

eMarketer does not conduct primary research. Neither a research firm nor a consultancy, eMarketer has no testing technique to defend, no research bias and no client contracts to protect.

eMarketer prepares each market report using a four-step process of aggregating, filtering, organizing and analyzing data from leading research sources worldwide.



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Using the internet and accessing a library of electronically-filed research reports and studies, the eMarketer research team first aggregates publicly available e-business data from hundreds of global research and consultancy firms. This comparative source information is then filtered and organized into tables, charts and graphs. Finally, eMarketer analysts provide concise and insightful analysis of the facts and figures along with their own estimates and projections. As a result, each set of findings reflects the collected wisdom of numerous research firms and industry analysts.

"I think eMarketer reports are extremely useful and set the highest standards for high quality, objective compilation of often wildly disparate sources of data. I rely on eMarketer's research reports as a solid and trusted source."
— Professor Donna L. Hoffman, Co-Director, eLab, Vanderbilt University

The Benefits of eMarketer's Aggregation Approach

Objective: information is more objective than that provided by any single research source
Comprehensive: gathered from the world's leading research firms, consultancies and news organizations
Authoritative: quoted in leading news publications, academic studies and government reports
All in one place: easy to locate, evaluate and compare
Readily accessible: so you can make quick, better-informed business decisions
Above the hype: accurate projections that business people can use with confidence
Time saving: there's no faster way to find internet and e-business stats, online or off
Money saving: more information, for less, than any other source in the world

"Benchmarking" and Future-Based Projections

Until recently, anyone trying to determine which researcher was most accurate in predicting the future of any particular aspect of the internet did not have a definitive source with which to do this. For instance, over 10 firms predicted e-commerce revenues for the fourth quarter 1998 online holiday shopping season, and yet no single source could be identified after the fact as having the "correct" number. In the Spring of 1999, however, the US Commerce Department finally began measuring e-commerce B2C activity so business people and others could have a benchmark with which they could compare and evaluate projections.

eMarketer has adapted its methodology to recognize that certain government and other respected, impartial sources are beginning to provide reliable numbers that can be consistently tracked over time. Most of these established sources, however, only measure past results; typically, they do not make future-based predictions.

Today, eMarketer formulates its Essential E-Business Numbers by first identifying the most established, reputable source for a given sector being measured and then adopting that organization's figures as *benchmarks* for the historical/current period. For instance, eMarketer's US internet user figures will be based on a combination of the most recent data from the US Census Bureau (August, 2000 survey) and the International Telecommunication Union (ITU). Using this data as the benchmark for 2000, eMarketer will make projections for subsequent years based on the following factors:

- a comparative analysis of user growth rates compiled from other research firms
- additional benchmark data from internet rating firms, e.g., Nielsen//NetRatings and Jupiter Media Metrix, which use panels to measure internet user activity on a weekly and monthly basis
- an analysis of broader economic, cultural and technological trends in the US

Similarly, US e-commerce revenues are being "benchmarked" using historical data from the US Department of Commerce, and broadband household and penetration rate forecasts are being built off baseline data from the Organization for Economic Cooperation and Development (OECD).

Through this benchmarking process, eMarketer will be holding itself – and our projections – accountable.

"When I need the latest trends and stats on e-business, I turn to eMarketer. eMarketer cuts through the hype and turns an overabundance of data into concise information that is sound and dependable."

— *Mark Selleck, Business Unit Executive, DISU e-business Solutions, IBM*

A. Introduction

By most accounts, the personal digital assistant (PDA) market has at the end of 2001 passed through an initial phase of rapid-growth that is typical of most new technology products, and it is about to embark upon a period of sustained, albeit less-spectacular, growth. Those who see the enormous upside potential for the PDA industry point out that although the market for PDAs may have reached saturation among early adopters of the new technology, widespread consumer adoption has yet to occur.

Optimists go on to note that the PDA industry has not even begun to tap the enterprise market, for which pilot projects are only getting underway at a few leading companies.

With declining prices, new applications, faster processing speeds, and improved memory being added to the latest generation of handheld computing devices, it is anticipated that PDAs will experience unit sales growth that outpaces most other segments of the technology industry. The convergence of formerly data-centric, handheld computers with wireless e-mail and voice communications is also expected to further stimulate wider business and consumer adoption of PDAs.

"The early-adopter market for handhelds is virtually saturated." *– Andy Buss, Canalys*

However, despite the promising long-term outlook for the PDA market, there is some uncertainty about its future as well. Indeed, PDA sales slowed considerably in 2001, as tough economic times had an impact upon consumer demand. It also appears that many buyers delayed their purchases of new PDAs as they awaited releases of next generation handheld devices. With product innovation that has resulted in a frequent upgrade cycle, many potential PDA users may continue to remain on the sidelines until the technology behind handheld computers stabilizes at a higher level of data, wireless and multimedia functionality.

Perhaps the largest threat to the handheld computer market comes from mobile phones, which are rapidly adding data capabilities that compete with those of PDAs. Although convergence of voice and data onto a single, mobile device is certainly anticipated as the final end-game by most industry observers, it remains to be seen which side of the market for mobile devices will win the middle ground.

In this first edition of the *PDA Market and Usage Report*, eMarketer covers the current status and trends that are shaping the PDA/Handheld computer market from the perspective of data-centric devices. Although convergence has already begun to blur the definitions between the different types of mobile devices, eMarketer believes that the market for handheld computers retains characteristics that remain significantly unique and separate from other wireless mobile devices.

Defining Handheld and Smart Mobile Devices, 2002

Handheld	Pocket-sized device designed primarily for data, no integrated wireless capability
Wireless handheld	Pocket-sized device designed primarily for data, has integrated wireless capability
Feature phone	Pocket-sized device designed primarily for voice, offers full two-way synchronization with PIM*, but applications cannot be added
Smart phone	Pocket-sized device designed primarily for voice, offers full two-way synchronization with PIM*, applications can be added

*Note: *Personal Information Management software*
Source: Canalys, 2001

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For further information about the market and trends behind other wireless devices, please see eMarketer's North American Wireless Report. http://www.emarketer.com/ereports/wireless_na/welcome.html

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B. Market Forecast and Growth Rates

Estimates for the size of revenues for the worldwide PDA market in 2000 have ranged from a low of $2.30 billion to a high of $3.25 billion. By comparison, revenues for the global PC market exceeded $200 billion in 2000, almost one hundred times the value of worldwide PDA sales.

The Aberdeen Group forecasts that PDA market revenues will nearly triple by 2005, to reach $6.6 billion, outpacing the rate of growth in the maturing PC market, which has seen revenues slow to a growth rate of 6% in 2002, after declining by 3% in 2001, according to UBS Warburg.

Worldwide PDA* Market, 2000 & 2005 (in billions)

*Note: *personal digital assistant*
Source: Aberdeen Group, 2001

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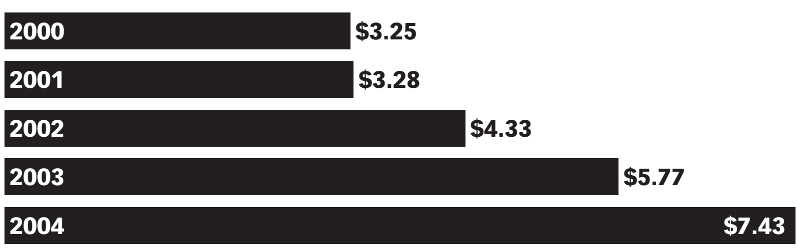
Another estimate by investment bank ABN AMRO is even more optimistic than the Aderdeen Group's, predicting that revenues for handheld computers will reach $7.43 billion by 2004 – almost $1 billion higher than Aberdeen's 2005 forecast. According to ABN AMRO's data, global PDA revenues saw only marginal growth from 2000 to 2001, which were impacted by the downturn in the US economy and falling consumer confidence. However, ABN AMRO expects demand to recover in 2002, with strong sales of handheld devices to continue through the next several years.

Global Handheld Device Market Revenue, 2000-2004 (in billions)



Source: ABN AMRO, 2001

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Unit sales of PDAs are expected to grow even faster than industry revenues, as average selling prices (ASPs) for PDAs will continue to fall. This in turn is expected to stimulate demand, which will increase unit sales to about 39 million PDAs worldwide by 2005, according to two separate forecasts from Gartner Dataquest and the Aberdeen Group. By comparison, Gartner Dataquest predicts that PC unit sales will reach 181.5 million units by 2005.

For more information about the PC industry, please see eMarketer's PC Market Report.
http://www.emarketer.com/ereports/pc_market/welcome.html

While most estimates forecast that PDA sales will grow to between 30 million and 35 million units within the next two years, the range of forecasts for 2004 is much broader, extending from between 29.2 million and 53.7 million units. An eighth comparative estimate by research firm Strategy Analytics predicts that worldwide PDA shipments will reach 85 million units by 2006.

Comparative Estimates: Handheld Shipments Worldwide, 2000-2005 (in millions of units)

	2000	2001	2002	2003	2004	2005
ABN AMRO	10.7	11.9	15.0	21.3	29.2	–
CSFB Technology Group	9.4	12.2	17.7	24.4	31.8	–
eTForecasts	12.2	–	22.4	–	35.6	–
Gartner Dataquest	10.9	12.3	16.0	23.1	31.6	39.2
International Data Corporation (IDC)	13.6	–	–	–	–	70.9
UBS Warburg	10.3	17.7	25.9	–	53.7	–
Aberdeen Group	9.0	11.8	16.8	23.1	30.7	39.3

Source: various, as noted, 2001

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Compared to the majority of research firms that have separate estimates for PDA sales, Datamonitor and Morgan Stanley have provided forecasts for the handheld device industry that are many times larger than those of other researchers. This difference can be explained by Morgan Stanley's inclusion of smartphones in its forecast definition, while Datamonitor uses a more inclusive definition of handheld devices in its forecast that includes any mobile phone with wireless application protocol (WAP) capability.

Handheld Shipments Worldwide, including Smartphones, 2000-2006 (in millions of units)

	2000	2001	2002	2003	2004	2005	2006
Datamonitor		67.7	94.8	129.5	169.8	227.7	300.9
Morgan Stanley	50.0	57.0	112.0	240.0	364.0		

Source: Datamonitor, Morgan Stanley, 2001

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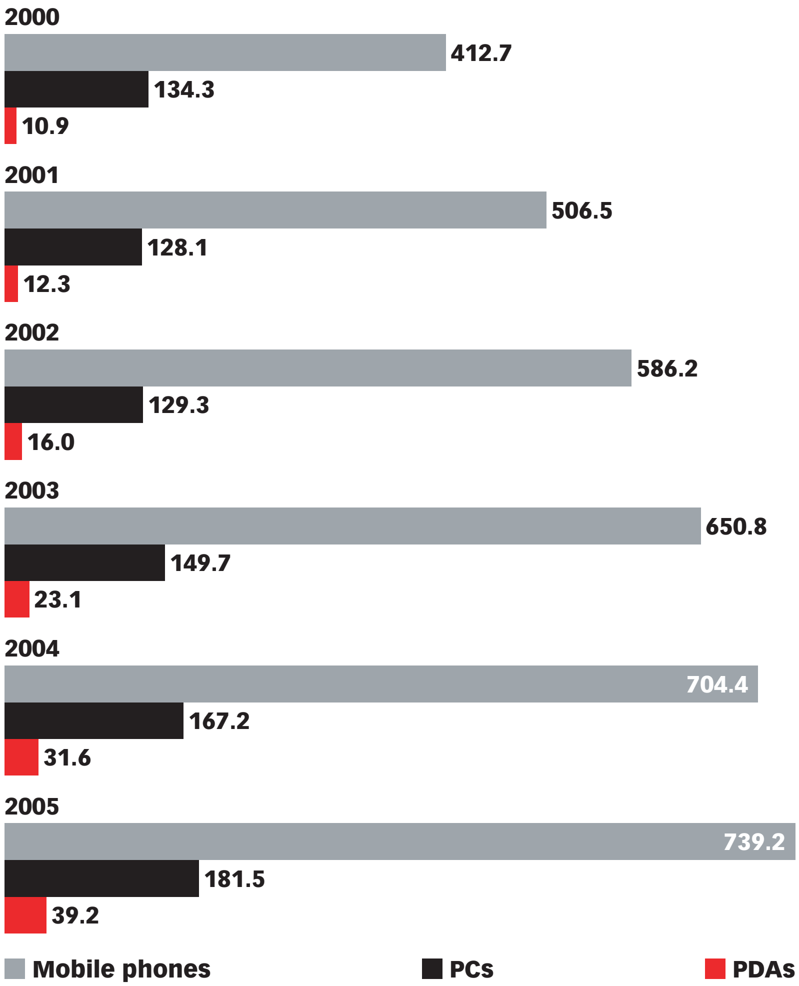
Gartner Dataquest's breakdown of PDA versus mobile phone sales serves to illustrate the uphill battle that PDA vendors have before them, as mobile voice and data convergence gains momentum. Because the majority of mobile device users have already chosen voice communications as their preferred wireless technology application, PDA vendors must compete against the installed base of mobile phones, as they try to convince consumers to use their alternative convergent devices.

Worldwide Mobile Phone, PC and PDA Shipments, 2000-2005 (in millions of units)



Source: Gartner Dataquest, 2001

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This competition among convergent devices will be especially difficult for PDA vendors in Western Europe and Asia, where countries such as Finland and Hong Kong have mobile phone penetration rates that exceed 80% of their populations. PDA manufacturers are expected to have a better opportunity to tap the North American consumer market, where mobile phones are used by approximately 43% of the population in the United States.

For further discussion of convergent devices, please see chapter VIII.

As an early-growth stage industry, the worldwide PDA market saw a significant increase in unit sales during 2000, with growth estimates ranging from between 62% and 106% for the year. By comparison, the worldwide PC market experienced year-over-year unit sales growth of approximately 11% in 2000, while mobile phone sales saw growth of 46% that same year.

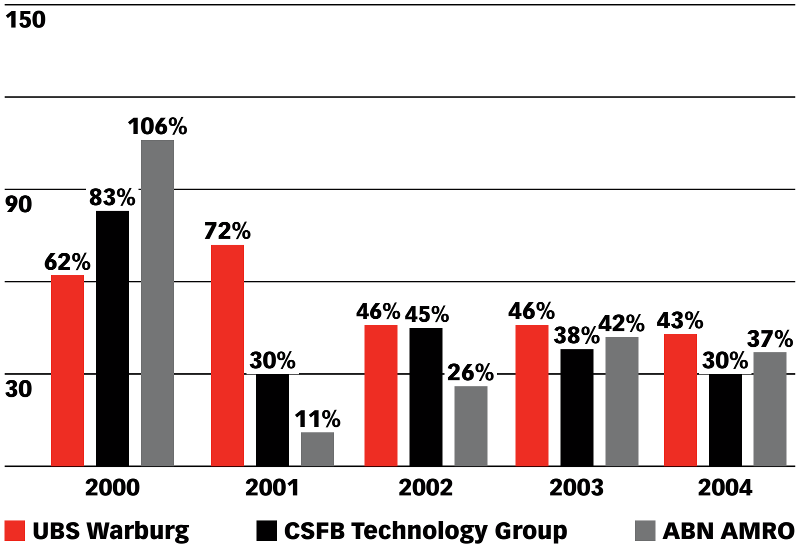
The broad economic slowdown in North America and Europe impacted sales of all technology products in 2001, including PDA sales. However, while mobile phone sales contracted by 10% last year, worldwide PDA unit sales posted growth of 18%, according to Gartner Dataquest.

Most research firms expect the PDA market to resume strong growth by the second half of 2002, as the US economy begins to rebound. It is anticipated that PDA sales will be helped by the release of Handspring's convergent voice and data device, the Treo, as well as Palm's release of its next-generation operating system in early summer. The enterprise market is also expected to boost sales, as large corporations restart their stalled wireless initiatives during the second half of the year.

Longer-term market growth will be impacted by continued product innovation, as more robust features are added to handheld devices. Reduced prices will help stimulate demand for PDAs among consumers as well, as the combination of lower prices and improved functionality should provide handheld computers with broader appeal.

Cahners In-Stat/MDR forecasts that worldwide PDA unit sales will increase by 18% in 2002, after growing by 17% in 2001. Market growth is expected to peak at 30% in 2005, when it is anticipated that the PDA industry will mature and sales will start to taper off. Similarly, ABN AMRO expects the market to grow by 11% in 2001 and 26% in 2002, increasing to 42% in 2003, following tremendous growth of over 100% in 2000.

Comparative Estimates: Year-over-Year Growth in Handheld Device Shipments Worldwide, 2000-2004



Source: various, as noted, 2001

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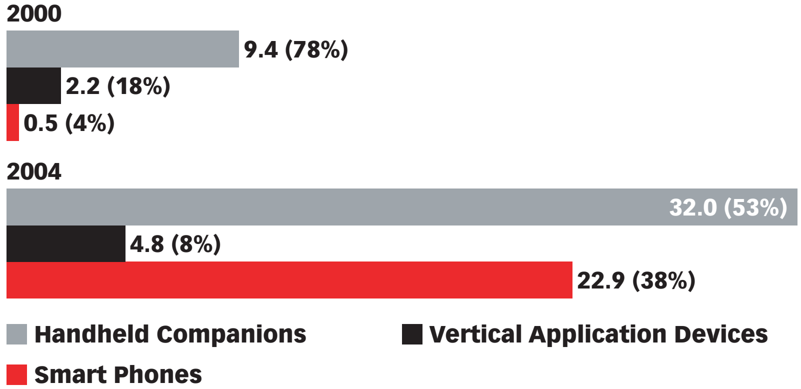
In its forecast for the wider handheld device market, which includes pen tablets and keypad handhelds, IDC predicts that unit sales will increase at a compound annual growth rate of 39% between 2000 and 2005.

When broken down by device format, handheld companions—the traditional PDA form of organizers that connect to PCs—are expected to lose their dominance to account for only one-half of the market in 2005. The other 50% of the handheld market will be dominated by convergent devices, or smartphones, like the current Kyocera and Samsung PDA-phones, or the Handspring Treo.

Vertical application devices with specialized features for vertical markets such as bar code scanners, PDAs with more durable, or "ruggedized" cases, and devices with Bluetooth or 802.11 wireless connectivity are expected to remain a relatively small, but increasingly lucrative portion of the market.

Worldwide Handheld Device Shipments, by Type of Device, 2000 & 2004 (in millions of units and as a % of total)



Source: International Data Corporation (IDC), 2001

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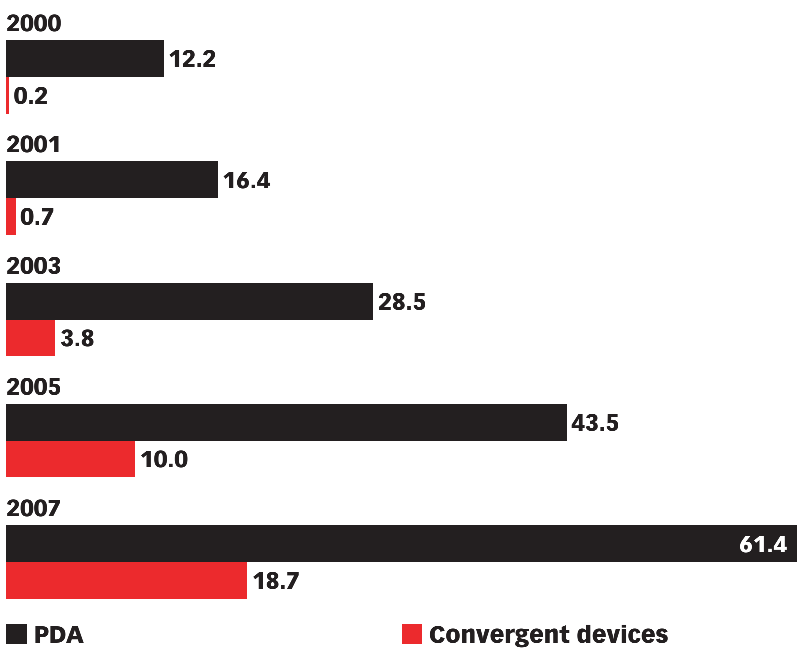
eTForecasts also predicts that convergent devices that combine the functions of PDAs and mobile phones will represent a substantial portion of the overall PDA market over the next five years, accounting for nearly one-third of total PDA unit sales worldwide. By eTForecasts' definition, PDA phones include data-enabled cellular phones.

PDA and Convergent Device* Unit Sales Worldwide, 2000-2007 (in millions)



*Note: *devices that provide PDA and mobile phone features*
Source: eTForecasts, January 2002

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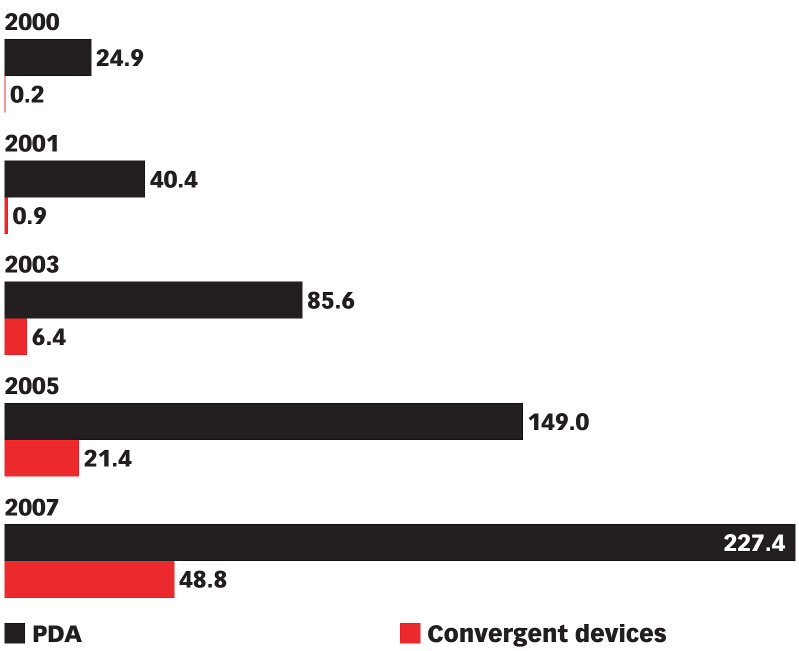
The research firm goes on to predict that phone-PDA sales will be stimulated by the rollout of next-generation, 2.5G and 3G cellular networks. Such convergent devices were found to be experiencing early success in Europe, and would experience rapid growth in Asia and the United States in 2002 and 2003.

With an estimated 61 million new PDA units to be sold in 2007, eTForecasts predicts that in five years there will be 227 million PDA units in use worldwide. Convergent devices are expected to account for just over 21% of all such PDAs worldwide, but 29% of PDAs in use in the United States.

Installed Base of PDAs and Convergent Devices* Worldwide, 2000-2007 (in millions of units)



*Note: *devices that provide PDA and mobile phone features*
Source: eTForecasts, January 2002

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PDA unit sales have historically been strongest in the United States, where mobile phones are less-widely used compared to other world regions. According to Gartner Dataquest, the United States held a 49.7% share of the global market for PDAs in 2001, while the Asia-Pacific region passed Western Europe to take a 17.4% share of worldwide PDA unit sales.

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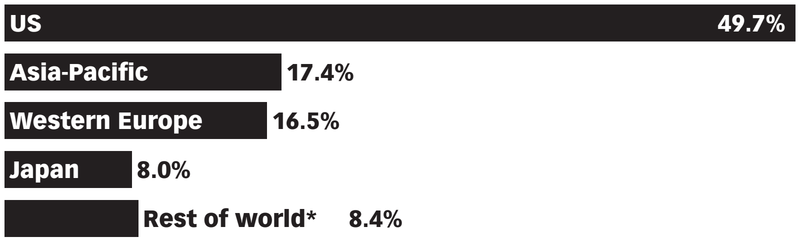
Breakdown of Worldwide PDA Unit Sales, by Region, 2001



*Note: *This percentage was calculated by eMarketer*
Source: Gartner Dataquest, 2002

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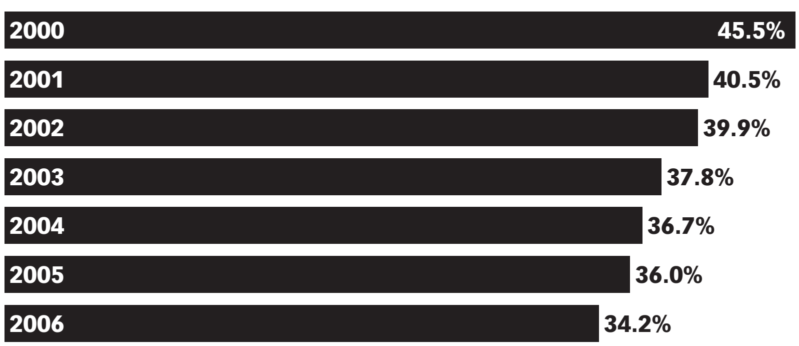
A comparative estimate by IDC places the United States' portion of worldwide PDA unit sales at 49% in 2000, although the research firm goes on to predict that this portion will decline to 38% by 2005, as unit sales in the Asia-Pacific region experience a CAGR of 60% between 2000 and 2005.

A third estimate by eTForecasts is similar to IDC's, projecting that the US share of worldwide PDA unit sales will decrease from 45.5% in 2000 to 34.2% in 2006.

US Market Share of the Worldwide PDA Market, 2000-2006



Source: eTForecasts, January 2002; eMarketer calculations, March 2002

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eTForecasts expects that PDA unit sales will see the strongest growth in Asia, increasing at a compound annual growth rate of 29.7% between 2000 and 2006, compared to a CAGR of 25.4% in Western Europe and 21.1% in the United States.

Handheld Device Unit Sales Worldwide, by Region, 2000-2006 (in millions)

	2000	2002	2004	2006	CAGR
US	5.5	9.0	13.1	17.5	21.1%
Western Europe	1.9	3.4	5.2	7.5	25.4%
Asia-Pacific	3.1	6.2	9.9	14.5	29.7%
Worldwide	**12.2**	**22.4**	**35.6**	**51.2**	**27.0%**

Source: eTForecasts, 2001

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A. PDA/Handheld Device Vendors

As the personal digital assistant industry moves out of its early growth phase and into an expansion stage, new entrants have increasingly begun to crowd the vendor market for handheld devices. Gartner Dataquest estimates that by the end of 2001, there were more than 18 different manufacturers selling various models of handheld computing devices.

"Mix together slow sales, strong competition, and a price war - suddenly you've got a recipe for losses."
– Steven G. Bush, Brighthand.com

This intensified competition has especially challenged leading vendors such as Palm and Handspring, which have found it necessary to revisit their business strategies and reduce operating costs. Some industry observers, such as Gartner Dataquest, have gone so far as to suggest that the two leading PDA manufacturers should merge, as a means of reducing the downward trend in PDA prices that is only serving to harm both companies.

"By the end of 2002, Handspring and Palm will merge to reduce their cutthroat price competition, reduce costs and improve shareholder value."
– Todd Kort and Ken Dulaney, Gartner Dataquest

Palm's early lead as the number one vendor of handheld devices has been steadily eroded over the course of 2001, as PDA sales have experienced a slowdown in general, and as competitors have been able to make gains at Palm's expense.

Following robust growth during the first quarter of 2001, a mixture of tough economic times and the anticipated release of next-generation handheld devices made for difficult sales of PDAs during the second and third quarters of the year.

On a sequential basis, total PDA sales worldwide dropped from 3.5 million units in the first quarter to 2.8 million units in the second quarter, and 2.5 million units in the third. The holiday season brought a dramatic rebound to the sector, with worldwide shipments reaching 4.3 million units during the fourth quarter. Sales in the fourth quarter were also helped by Palm's and Handspring's price-cutting, as both vendors sought to reduce inventories.

According to Gartner Dataquest, the worldwide PDA market saw total sales increase by an additional 2 million units in 2001. Among the leading vendors, Palm saw the largest decline in year-over-year sales, which fell by about 500,000 units for the year. However, while sales declined sequentially through the first 3 quarters of 2001, total industry sales for the year remained above the market level in 2000.

PDA Unit Shipment Estimates Worldwide, by Vendor, Q3 2001

Company	Shipments (in thousands)	Market Share
Palm	754	29.7%
Handspring	352	13.9%
Compaq	185	7.3%
Casio	143	5.6%
Hewlett-Packard	135	5.3%
Minren	130	5.1%
Others	838	33.0%
Total Market	**2,538**	**100.0%**

Source: Gartner Dataquest, November & August 2001

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PDA Unit Shipments and Market Share Worldwide, by Vendor, 2000-2001

	2001 Ship-ments (millions)	2001 Market share (%)	2000 Ship-ments (millions)	2000 Market Share (%)	Growth (%)
Palm	5.1	38.6%	5.6	50.4%	-9.5
Handspring	1.6	12.6%	1.4	12.4%	20.4
Compaq	1.3	9.8%	0.5	4.2%	175.4
Hewlett-Packard	0.7	5.4%	0.4	4.0%	60.9
Casio	0.5	4.0%	0.4	4.0%	20.4
Others	3.9	29.6%	2.8	25.1%	39.9
Total Market	**13.1**	**100.0%**	**11.1**	**100.0%**	**18.3**

Source: Gartner Dataquest, February 2002

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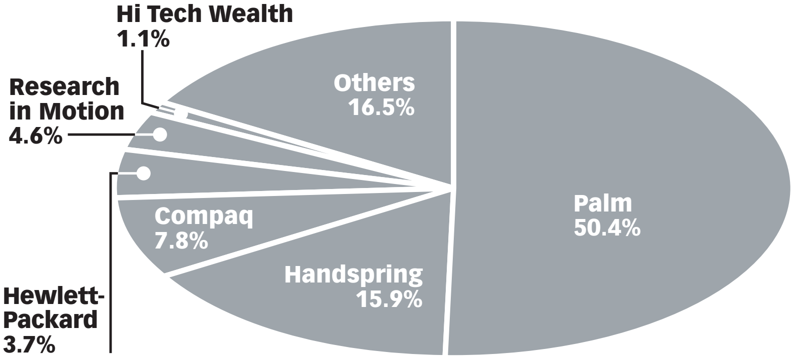
As of the third quarter of 2001, Palm had seen its market share decline to 29.7% of all PDA unit sales, down from 50.4% of unit sales in the first quarter.

Worldwide PDA Market Share, Q1 2001



Source: Gartner Dataquest, November 2001

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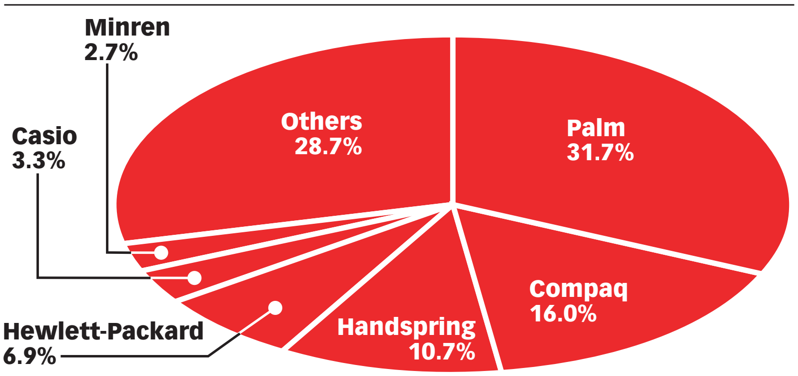
The number-two position in the PDA market has alternated between Handspring and Compaq during the second and third quarters of 2001, as the release of Compaq's iPAQ increased its sales to 450,000 units during the second quarter, versus Handspring's sales of 300,000 units. But by the third quarter, Handspring had regained second place in the PDA market, outselling its third-place rival by a count of 352,000 units to Compaq's 185,000 units.

Worldwide PDA Market Share, Q2 2001



Source: Gartner Dataquest, November 2001

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As the sales data shows, individual PDA vendors' quarterly sales have been rather volatile to date, largely due to the fact that they are easily impacted by the release of new products. Even rumors of next generation devices or operating systems have been enough to cause buyers to delay purchases in anticipation of future product releases.

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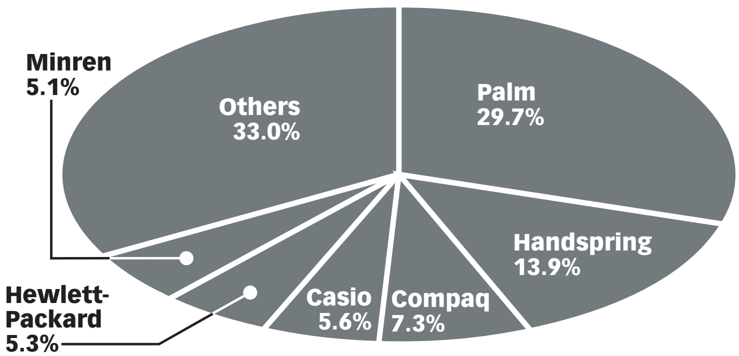
As an example of these delays, word of Microsoft's late-2001 release of its Pocket PC 2002 operating system impacted handheld sales during the third quarter, as buyers chose to hold off on purchases until the latter part of the year.

Worldwide PDA Market Share, Q3 2001



Source: Gartner Dataquest, November 2001

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The impact of PDA prices on consumer demand was evident during the fourth quarter of 2001, as Palm offered its low-end PDA for about $100, while Handspring slashed prices to clear out its inventory as well. Average PDA selling prices fell to $165 during the holiday season, according to Gartner Dataquest, as unit sales saw sequential growth jump 58% over the third quarter, although year-over-year growth fell by 2% compared to the fourth quarter of 2000.

Gartner estimates that no more than 20% of PDA buyers are willing to pay more than $400 for a PDA, while data from NPD Intelect confirms that the several PDA buyers have continued to buy lower-end units that typically do not have color screens. On the other hand, as color screens for Palm devices are improved and as prices for these units come down, it is anticipated that the percentage of Palmtops sold with color screens will grow higher in 2002.

Palmtops Sold with Color Screens Worldwide, 2000 & 2001 (as a % of new palmtops sold)

Source: NPD Intelect, 2002

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Most analysts anticipate continued sluggish growth for the overall market through the first half of 2002. However, sales are expected to get a lift from Handspring's much-anticipated Treo communicator, which in early 2002 has been the recipient of some very positive reviews.

B. PDA Operating Systems Vendors

While Microsoft Windows is by far the leading operating system that is used on 88% of personal computers, the PDA market has not yet come to be dominated by a single platform vendor. Palm and Microsoft are continuing to compete for the preeminent position, with their respective Palm OS and Pocket PC operating systems.

Other platforms, including Symbian OS and Linux each held a small share of the handheld OS market in 2001 as well, although the Linux platform appears to be receding from the race, while Symbian's roots lie in the mobile telephone market.

From the perspective of the user, the Palm and Microsoft platforms have differing philosophies toward the PDA, with each offering separate advantages and disadvantages. In general, handhelds that run on the Palm OS are less expensive, simpler, smaller and more efficient with battery power. By contrast, Pocket PC handhelds offer more features, faster processors and larger screens, all of which come at the expense of a much shorter battery life and higher prices.

Perhaps more importantly, the difference in functionality and price between the two platforms has attracted two distinct audiences. The Pocket PC handhelds have predominately attracted business users, while the Palm OS handhelds are attractive to a wider consumer audience.

"All the Pocket PC models look the same, whether they are from Compaq, Toshiba, Casio or Hewlett-Packard." *–Kim Mui, IDC*

While Palm OS devices were initially designed to serve as personal organizers, they have since developed the ability to add multimedia features such as audio and color graphics. On the other hand, Pocket PC devices were designed to appear as though the common, PC-based Windows operating system had been shrunk down to a handheld form. By most accounts, Pocket PCs provide superior multimedia capabilities, but are more complicated to use.

Not unlike its position as a vendor of handheld devices, Palm's early lead in the platform space is also under assault from intense competition. Although Palm remains the market leader with a 69% share of all PDA sales worldwide in 2001, Microsoft has been steadily gaining ground with each new release of Pocket PC, with its most recent version, Pocket PC 2002, having been released in the fourth quarter of 2001.

In 2002, Pocket PC devices are expected to ship in smaller form factors and at lower price points. Many users continue to be attracted to the Pocket PC platform because of its multimedia capabilities, vivid displays and ability to run more complex applications. Palm, however, plans to release version 5 of the Palm OS in early-summer 2002, which will bring the wireless data and multimedia capabilities of the Palm platform substantially closer to those offered by Pocket PC.

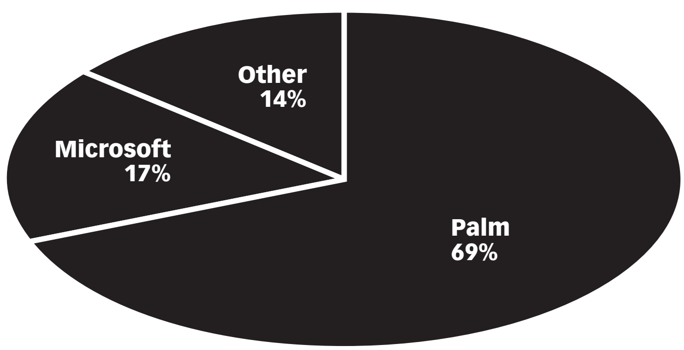
According to Gartner Dataquest, Microsoft has already made significant strides in closing the gap with Palm during 2001, as the Pocket PC platform nearly doubled its market share during the course of last year, shipping 21% of all PDA units.

Microsoft Pocket PC Platform Share of the Handheld Device Market Worldwide, 2000-2001

Source: Gartner Dataquest, February 2002

Gartner Dataquest has gone on to estimate that about one-sixth of PDAs used proprietary operating systems in 2001, with the majority of these PDAs being sold in Asia. By comparison, IDC estimates that 14% of PDA units sold last year had operating systems that were from neither Palm nor Microsoft.

Market Share of Leading PDA* Operating Systems, 2001

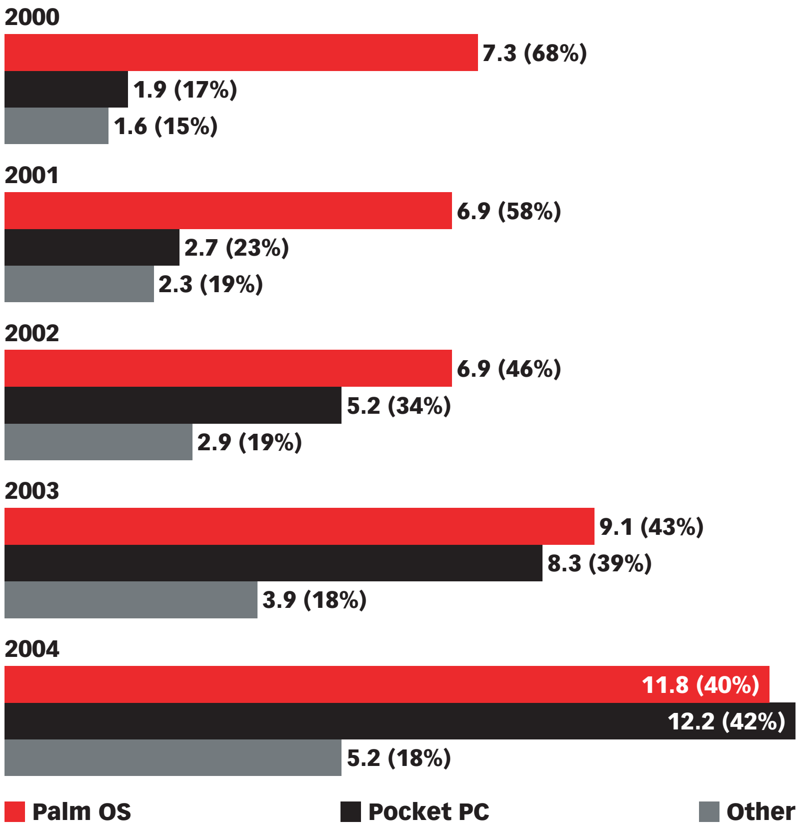


*Note: *personal digital assistant*
Source: International Data Corporation (IDC), 2001

In 2002, IDC expects that the Pocket PC operating system will grow to a market share of more than 30% of all PDA unit sales, and eventually close the gap with the Palm OS by 2005.

A comparative estimate by investment bank ABN AMRO predicts that Microsoft will overtake Palm in market share one year earlier, in 2004.

Worldwide Handheld Shipments, by Platform, 2000-2004 (in millions of units and as a % of total)



Source: ABN AMRO, 2001

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As was the case in the PC industry, the key to leadership as a platform vendor in the PDA market will depend upon the ability of OS vendors to successfully partner with hardware manufacturers. Palm's advantage to date has come in large part through its own PDA unit sales, thanks to its position as the leading vendor of handheld devices. Its relationship with the number two handheld device vendor, Handspring, has further added to the strength of Palm's position.

Handheld OS Licensees, 2001

Palm OS	Microsoft Pocket PC
Acer	Audiovox
Garmin	Casio
HandEra	Compaq
Handspring	Hewlett-Packard
Kyocera	Internec
Nokia	Symbol
Palm, Inc.	Toshiba
Samsung	
Sony	
Symbol	

Source: Palm, Microsoft, 2001

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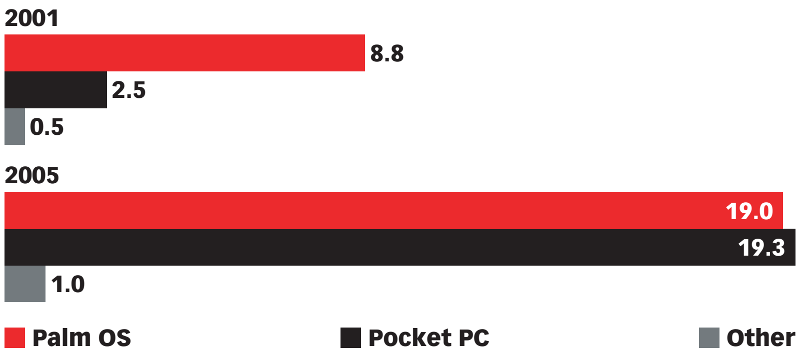
Partnering with hardware vendors is a strategy that Microsoft, of course, knows all too well. According to Gartner Dataquest, Microsoft had signed approximately 20 licenses with handheld vendors by the end of 2001. Key partners include Compaq, Hewlett-Packard and Toshiba – three vendors that each have a strong presence in the broader enterprise hardware market.

And with the enterprise market for handheld devices considered to still be up for grabs, Microsoft has a further advantage in accessing the business market, as Microsoft's other edge comes from the interoperability of its handheld OS with the Windows OS that is widely deployed on most business PCs.

However, because it requires more powerful processors and larger color screens, many industry observers believe that the Pocket PC platform will be more readily accepted within the enterprise market than the Palm OS platform. Gartner Dataquest believes that the market will become stratified, with less expensive Palm OS devices serving as personal organizers, or used for lightweight enterprise applications, while Pocket PC devices will run more robust enterprise and multimedia applications.

Citing the overall advantages that it sees for Microsoft within the enterprise market, the Aberdeen Group expects the Pocket PC platform to overtake Palm as the leading handheld OS in 2005.

Worldwide Handheld Shipments, by Platform, 2001 & 2005 (in millions of units)



Source: Aberdeen Group, 2001

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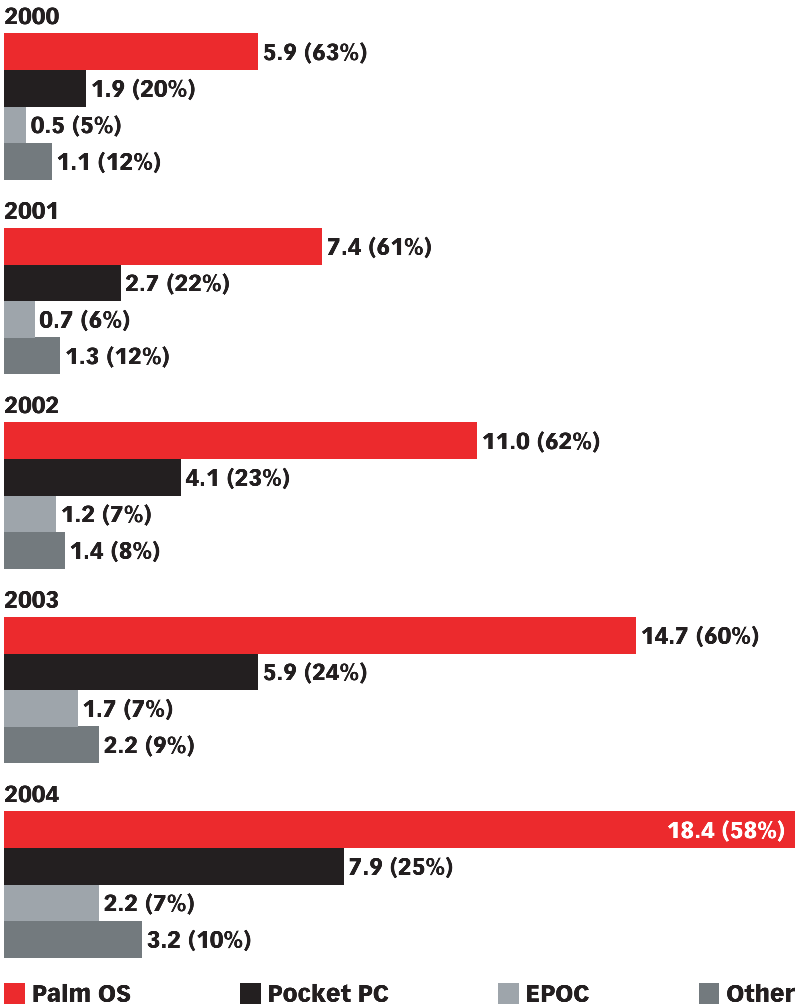
On the other hand, some analysts have noted that for wireless e-mail and other light application needs, many companies may in fact prefer to purchase Palm devices that sell at a lower price. Credit Suisse First Boston, for example, expects that Palm will retain its lead, and that the Pocket PC's share of the handheld OS market will remain at about one-quarter of total unit sales.

Worldwide Handheld Shipments, by Platform, 2000-2004 (in millions of units and as a % of total)



Source: CSFB Technology Group, 2001

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While the Palm OS and Pocket PC have dominated the market for handheld devices to date, other platforms may be expected to have greater success in the future. Should smartphones and hybrid handheld devices become more popular over time, the Symbian OS - which is designed for hybrid mobile phones and supported by several of the largest mobile phone handset manufacturers – could potentially benefit the most.

Already deployed in Europe, UK-based research firm Canalys reports that Symbian-based smartphones from Nokia captured 34% of the market for handheld devices in the third quarter of 2001.

Mobile Phone Manufacturers Licensing Symbian OS, 2002

Ericsson	Nokia
Kenwood	Siemens
Matsushita (Panasonic)	Sony Ericsson
Motorola	

Source: Symbian, 2002

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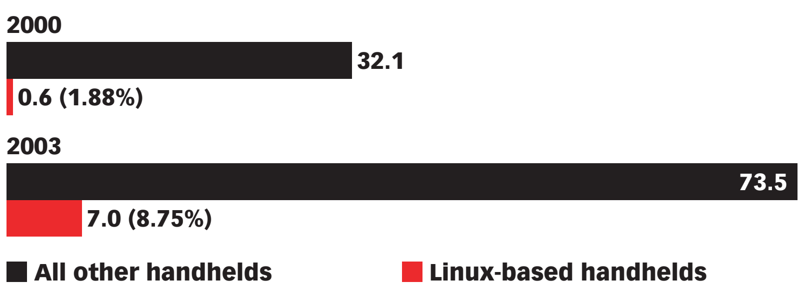
Due to the fact that most major handheld device manufacturers already work with Palm or Microsoft, there has been very little room for Linux to gain traction in the market for PDAs. Nonetheless, ResearchPortal.com predicts that Linux-based handhelds will increase their share of the handheld market from 1.9% in 2000 to 8.7% of the market by 2003.

Installed Base of Linux-Based Handheld Devices Worldwide, 2000 & 2003 (in millions of units and as a % of total handheld installed base)



Source: ResearchPortal.com, 2001

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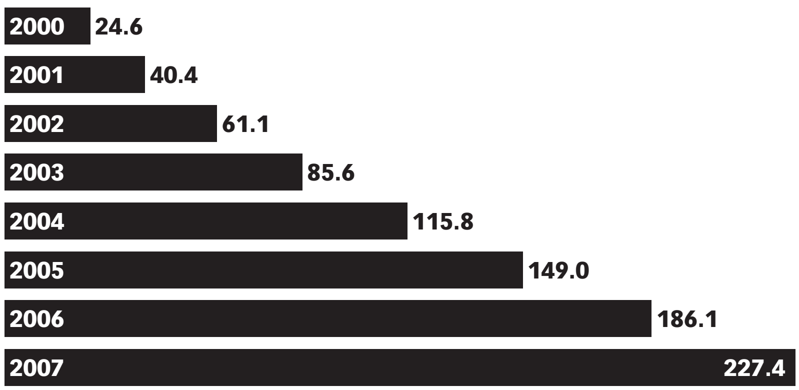
C. PDA Usage and Market Trends

As PDA sales grow over the next several years, the number of PDAs in use is expected to increase significantly as well. eTForecasts estimates that the number of PDAs in use worldwide will reach 227.4 million by 2007, which is comparable to the number of PCs that were in use worldwide by 1994.

PDAs in-Use Worldwide, 2000-2007 (in millions of units)



Source: eTForecasts, 2001

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Indeed, it is possible that a similar pattern of growth may occur for the PDA market as was experienced by the PC market during the 1990's, as PDAs become cheaper and acquire improved functionality. Consumers will also become more likely to purchase a PDA device once upgrade cycles are extended, and PDAs have more capabilities that meet most users' basic needs for a handheld device.

"The hardware capabilities of the typical 2007 PDA will be similar to the 2001 low-end PC."
– eTForecasts, 2002

Of course, PDA users do not make their entire decision to buy based on price alone – device capabilities and functionality are important factors that buyers consider as well.

The Aberdeen Group shows the average selling price to be lower, expecting it to fall from $255.55 in 2000 down to $167.94 by 2005. While the Pocket PC devices generally offer more features, higher quality screens, better multimedia support and much more memory, they also come at a higher price. For example, the average selling price for handhelds using the Pocket PC OS was about $150 higher than handhelds running the Palm OS in the United States during August 2001.

According to Gartner Dataquest, the average selling price (ASP) for the overall PDA market fell 6.4% in 2001, from $296 in 2000 to $277 per unit last year.

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Average Selling Price for Handheld Devices Worldwide, 2000 & 2001

Source: Gartner Dataquest, 2002

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ABN AMRO expects this trend of declining prices to be reversed in 2002, as next-generation devices and growing demand permit manufacturers to raise the average selling price for PDAs by about 5% this year. Average PDA selling prices will resume their downward trend in 2003, however, as they fall from $289 in 2002 to $255 per unit by 2004.

Average Selling Price of PDAs Worldwide, 1999-2004

Source: ABN AMRO, 2001

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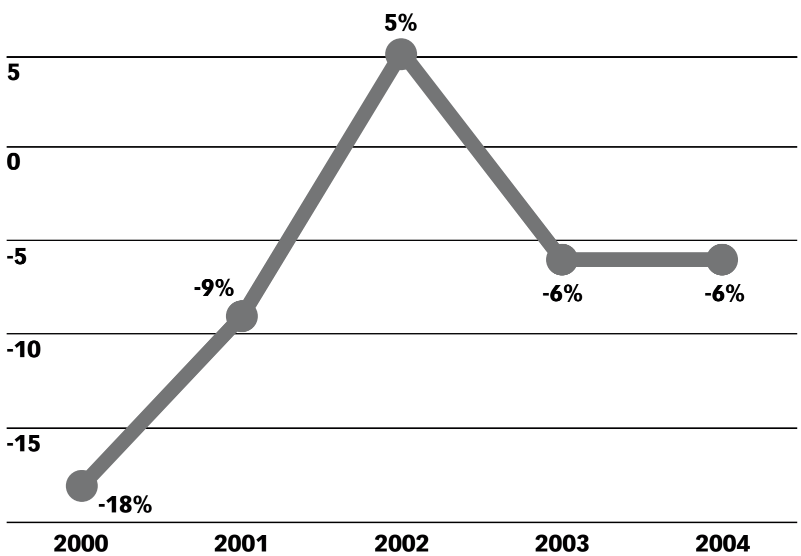
Year-over-Year Change in Average Selling Price of PDAs Worldwide, 2000-2004



Source: ABN-AMRO, November 2001

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ABN AMRO expects the yearly decrease of the average handheld sale price to decrease through 2002, before resuming a steady downward trend, falling from $304 in 2000 to $255 in 2004. A comparative estimate from the Aberdeen Group is much lower than ABN AMRO's, putting the average selling price for PDAs at $255 in 2000, with a forecast ASP of just under $168 by 2005.

Average Selling Price of PDAs Worldwide, 2000 & 2005

Source: Aberdeen Group (calculations by eMarketer), 2001

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In a 2001 survey of urban technology users, Euro RSCG Worldwide found that PDAs were most commonly owned in the United States, where 64% of respondents said that they had a PDA. This was far ahead of other world regions, where mobile phone penetration rates tended to outpace those of the United States. It should be noted, however, that this survey was skewed toward technology users, and the results should not be considered to be representative of regions' wider populations.

Urban Household Mobile Device Adoption Worldwide, 2001

	Europe/ Middle East	Asia-Pacific	US	Latin America	World
Internet-enabled mobile phone	28%	28%	26%	21%	27%
Mobile phone (not internet-enabled)	85%	78%	78%	81%	81%
PDA	30%	41%	64%	49%	39%

Source: Euro RSCG Worldwide, 2001

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Not surprisingly, technology users in Tokyo were most likely to have convergent voice and data capabilities through mobile phones, while London and Amsterdam were a little farther behind. PDA adoption rates were lowest in Tokyo and Amsterdam – two markets in which consumers are well-served by alternative handheld devices such as smartphones.

Household Adoption of Mobile Devices in Selected Global Cities, 2001

	London	Amsterdam	Sydney	Tokyo
Internet-enabled mobile phone	36%	27%	14%	75%
Mobile phone (not internet-enabled)	84%	91%	88%	39%
PDA	42%	33%	66%	25%

Source: Euro RSCG Worldwide, 2001

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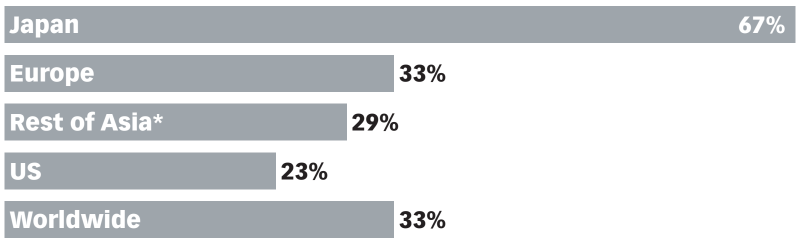
In a more recent survey of 5,600 mobile phone users, AT Kearney and the Judge Institute of Management Collaboration found that in January of 2002, 33% of mobile phone users worldwide had internet-enabled phones. Japan led the way with 67% of mobile phone users having wireless internet access, followed by Europe with 33% of users.

In the year-prior survey conducted in January 2001, the penetration rate of mobile phones with internet access was just 16% worldwide, while Europe and Japan had penetration rates of 14% and 33%, respectively.

Penetration of Internet-Enabled Phones (IEPs) among Mobile Phone Users Worldwide, January 2002



*Note: n=5,600 mobile phone users; *includes China, Hong Kong, Korea, Taiwan, Singapore and Australia*
Source: A. T. Kearney , February 2002

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Because voice communication is the single most important application for the majority of mobile device users, consumers are more likely to purchase a mobile telephone than a PDA, to serve as their primary mobile device. "Gadget overload" then becomes a problem for potential PDA customers, who may not want the bother of juggling multiple mobile devices on a regular basis.

Perhaps the best competitive opportunity for PDA vendors lies in their ability to offer mobile internet access – a market that is for the most part, still up for grabs. Although text messaging and e-mail access are commonly offered on mobile telephones, PDAs are better-suited for navigating websites and creating e-mail messages, thanks to their advanced operating systems and better data entry features. It has been noted, for example, that in order to type the word "hello," a user must press 13 buttons on a mobile phone.

To the extent that PDA vendors are able to provide wireless data capabilities that are combined with voice technology, the better they will be able to compete with the offerings of mobile phone manufacturers.

But even with convergent PDA devices that have both digital and voice features, PDA vendors face an uphill battle against the significant installed base of more than 1.2 billion mobile phones throughout the world. Thanks to their decades-long head start, mobile phone vendors are able to sell their next-generation digitally-enabled phones to these established customers.

At present, most wireless telephone service providers include either free internet access as part of their wireless subscription plans, or charge an additional $10 to $14 per month for mobile internet access. By comparison, internet service providers charge PDA users approximately $40 to $60 per month to gain mobile internet access through their devices.

Over the mid- to long-term, mobile telephone manufacturers and PDA vendors will become increasingly competitive with one another, as they develop all-in-one devices that provide both voice and internet data access, along with other, more robust features.

A. Market Forecasts and Growth

North America is currently the largest market in the world for personal digital assistants, and is expected to remain so for the foreseeable future. According to IDC, the US market for PDAs accounted for nearly half of all handheld devices that were sold worldwide in 2000. However, as PDA unit sales in other regions of the world increase, America's market share is expected to decline to about 38% of all handheld device sales in 2005.

US Share of Global Handheld Device Market, 2000 & 2005

Source: International Data Corporation (IDC), 2001

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Research firm NPD Techworld estimates that revenues from the sale of handheld devices in the United States grew from $1.03 billion in 2000 to $1.29 billion in 2001, an increase of about 25% year-over-year.

US Handheld Device Revenues, 2000 & 2001 (in billions)

Source: NPD Techworld, 2002

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Comparative estimates for the number of PDAs sold in the United States range from 5.7 million to 9.6 million units in 2001. The most optimistic estimate predicts that US PDA sales will grow to as many as 17.5 million units by 2006, while Gartner Dataquest expects PDA sales will reach 15.8 million units in 2005.

By comparison, Gartner estimates that PC unit sales in the United States will come in at just under 55 million units in three years' time.

Comparative Estimates: PDA Shipments in the US, 2000-2006 (in millions of units)

	2000	2001	2002	2003	2004	2005	2006
Gartner Dataquest	5.6	5.7	6.8	9.4	12.7	15.8	–
eTForecasts	5.5	–	8.9	–	13.1	–	17.5
International Data Corporation (IDC)	5.3	5.3-6.1	–	–	–	–	–
Consumer Electronics Association (CEA)	6.1	9.6	–	–	–	–	–
Jupiter Media Metrix	–	9.4	–	13.5	–	17.0	–

Source: eMarketer, 2002; various, as noted, 2001

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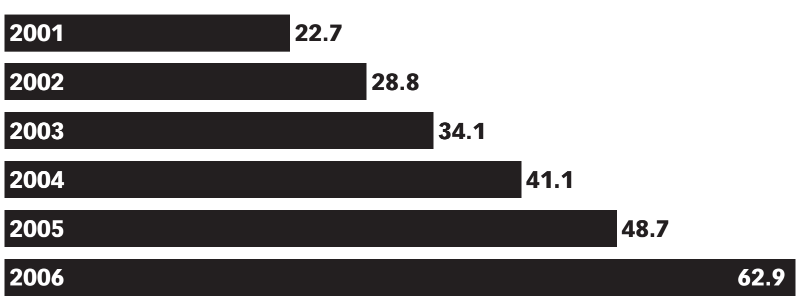
Compared to other research firms, Datamonitor uses a broader definition of handheld devices that includes smartphones. The London-based research firm predicts that North American handheld shipments will grow by 6.1% in 2002, as vendors sell 28.8 million units in the United States and Canada. Handheld unit sales are expected to more than double to 62.9 million units within the next four years.

Handheld Shipments in North America, 2001-2006 (in millions of units)



Source: Datamonitor, 2001

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As for the installed base of PDA units, eTForecasts predicts that there will be as many as 68.3 million PDAs in use in the United States by 2006, up from 18.5 million in 2001. The research firm expects the number of PDA users to increase by more than 8 million new users per year, over the next three years. Adoption rates are forecast to accelerate in 2004, when 11 million new users will buy PDAs.

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By comparison, the Yankee Group expects PDA use in the United States will grow by less than 7 million new users in 2002 and 2003, to bring the installed base of PDAs to 26.6 million units within the next two years.

Comparative Estimates: Installed Base of PDAs in the US, 2000-2006 (in millions of units)

	2000	2001	2002	2003	2004	2005	2006
Yankee Group	8.8	13.3	19.7	26.6	–	–	–
eTForecasts	12.3	18.5	26.9	35.2	46.2	56.6	68.3

Source: eTForecasts; Yankee Group, 2001

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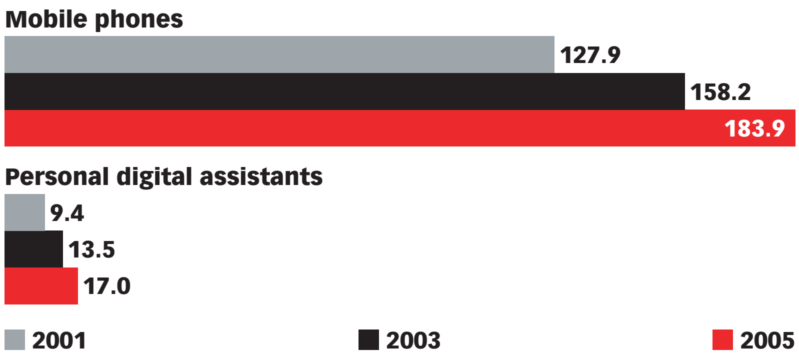
Despite anticipated growth in the number PDA users over the next several years, the installed base of mobile phones in the United States will continue to dwarf that of PDAs by a ratio of more than 10 to 1. Jupiter Media Metrix predicts there will be almost 184 million US mobile phone users by 2005, compared to just 17 million PDA users.

US Mobile Device Users, 2001-2005 (in millions)



Source: Jupiter Media Metrix, 2001

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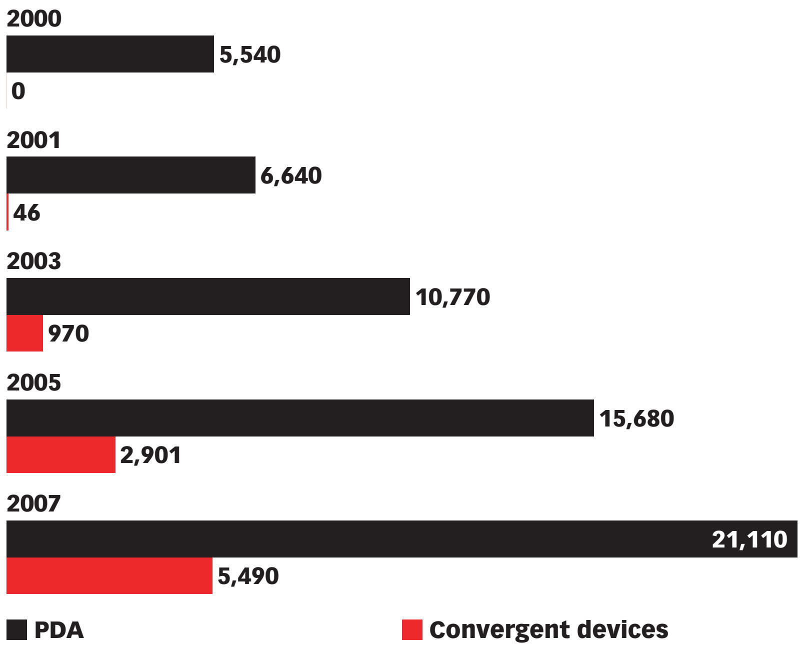
As of early 2002, the Cellular Telecommunications and Internet Association (CTIA) estimates that there are 130.6 million mobile phone subscribers in the United States.

When unit sales of convergent devices are broken out from those of PDAs, sales of voice-data devices in the United States were negligible in 2000, according to eTForecasts, and totaled only 46,000 units in 2001. With the release of several convergent devices in 2002, forecasts for sales of the Handspring Treo range from 100,000 to 390,000 units alone.

By 2003, eTForecasts predicts that sales of convergent devices will grow to almost 1 million units, and then reach 5.5 million units within the next five years.

PDA and Convergent Device* Unit Sales in the US, 2000-2007 (in thousands)



*Note: *devices that provide PDA and mobile phone features*
Source: eTForecasts, January 2002

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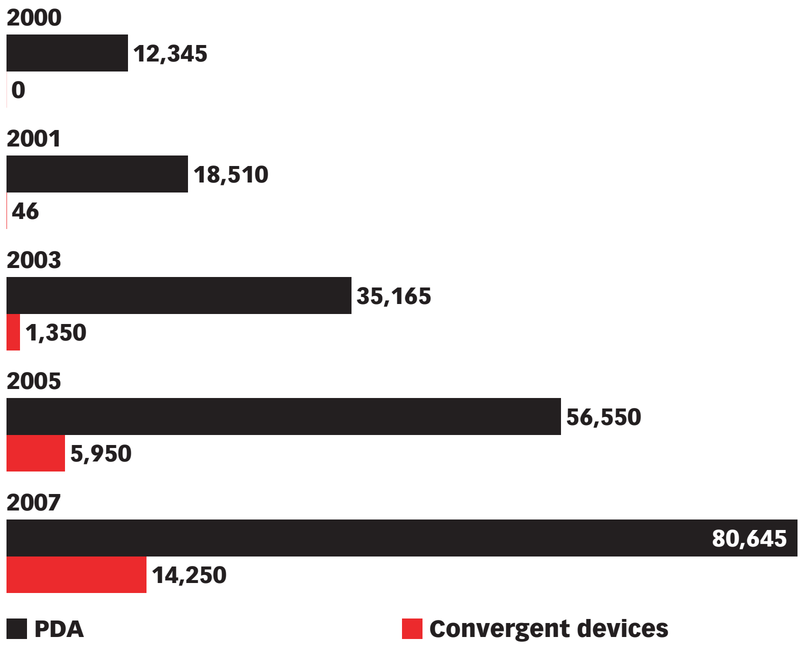
As a portion of the installed base of handheld devices, convergent voice-phone devices are forecast to grow from less than 1% of all handheld devices in the United States during 2001, to 17.6% of the installed base of devices by 2007.

Installed Base of PDAs and Convergent Devices* in the US, 2000-2007 (in thousands)



*Note: *devices that provide PDA and mobile phone features*
Source: eTForecasts, January 2002

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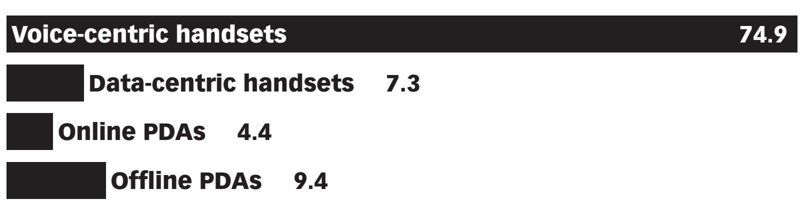
A separate forecast by Jupiter Media Metrix estimates that by 2005, the number of people accessing the internet through wireless devices will reach 96 million in the United States. More than three-quarters of those people, 78.0% of wireless internet users, are projected to access the internet through a voice-centric handset, while just 7.6% of all users will access the internet through a data-centric handset.

Projected US Wireless Web Users, by Device, 2005 (in millions of users)



Source: Jupiter Media Metrix, 2001

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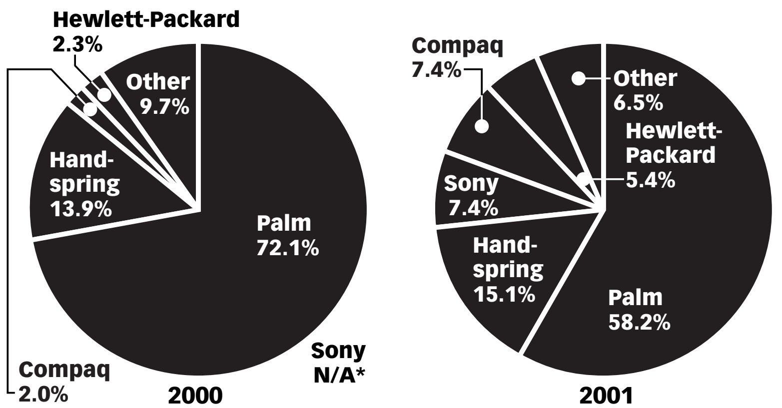
B. Market Share of Leading Vendors

The US PDA market experienced a difficult year in 2001 — overall unit sales grew by just 8.6%, according to Gartner Dataquest. Competition heated up as new vendors joined the market, and as PDAs running Microsoft's Pocket PC operating system attracted growing numbers of enthusiastic users.

Not unexpectedly, Palm continued to witness the erosion of its position as the leading vendor of handheld devices last year, as NPD Techworld estimates that Palm's share of the US market dropped from 72% of unit sales in 2000, to just under 58% of unit sales in 2001.

PDA Market Share in the US, 2000 & 2001 (as a % of unit sales)



*Note: *negligible*
Source: NPD Techworld, 2002; Wall Street Journal, January 2002

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A comparative estimate by Gartner Dataquest puts Palm's share of the US PDA market at an even lower 47.1% in 2001, down from a 58.7% share of unit sales in 2000.

Several observers have indicated that Palm's market share is declining in part because it has been outclassed by both the more expensive and expandable Pocket PC devices, as well as its own Palm OS competitors, Sony and Handspring, which are said to offer better features than Palm does for its own devices.

As a result, Palm was the only PDA vendor to see its US sales decrease in 2001. According to Gartner Dataquest, Palm's unit sales fell by 12.9% last year, while Compaq saw its PDA sales shoot up by 127.7%. Hewlett-Packard saw its PDA sales grow 85.1%, albeit from a smaller base.

After Palm, Handspring experienced the second-lowest growth rate among the top five vendors, as its sales increased by just 6.1%.

PDA Unit Shipments and Market Share in the US, by Vendor, 2000-2001

	2001 Shipments (thousands)	2001 Market share (%)	2000 Shipments (thousands)	2000 Market Share (%)	Growth (%)
Palm	3,068	47.1%	3,523	58.7%	-12.9
Handspring	1,281	19.7%	1,207	20.1%	6.1
Compaq	568	8.7%	249	4.2%	127.7
RIM	430	6.6%	395	6.6%	8.9
Hewlett-Packard	383	5.9%	207	3.5%	85.1
Others	785	12.0%	418	7.0%	87.8
Total Market	**6,515**	**100.0%**	**5,999**	**100.0%**	**8.6**

Source: Gartner Dataquest, February 2002

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Due in part to the US economic slowdown, 2001 has been a year of historically weak growth for the overall handheld device market. Unit sales of PDAs dropped steadily on a quarterly basis through the end of the third quarter, although sales rebounded with some strength during the holiday season.

But besides economic considerations, many PDA buyers also delayed purchases, as they preferred to wait for the autumn release of Microsoft's Pocket PC 2002 operating system. The mid-2002 release of Palm's latest operating system, as well as the arrival of new convergent voice and data PDAs have also been factors in several buyers' decisions to put off PDA purchases until 2002.

This year should prove to be an important one for Palm in particular, as the company has made the strategic decision to separate its operating system division, now called PalmSource, from the hardware operations of its business.

Sales are expected to get a boost from the early summer release of the Palm OS 5.0, as well as Palm's i705 handheld device, which targets the enterprise market for PDAs. The i705 Wireless Messaging Solution facilitates the secure, mobile transmission of e-mail, along with other enterprise software applications.

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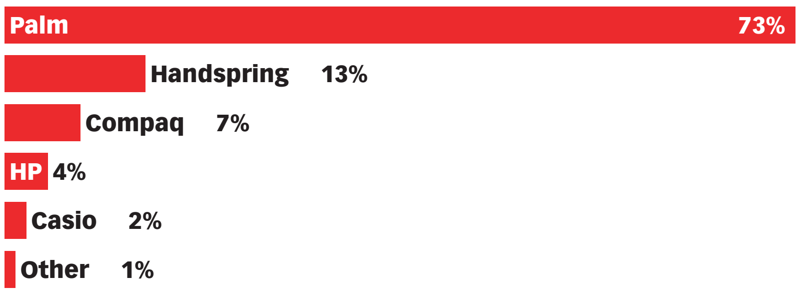
Not unlike the US market, Canadian PDA sales are dominated by Palm as well, which sold 73% of all PDA units in Canada during the first half of 2001. According to ACNielsen, the top five vendors in Canada are rounded-out by Handspring, Compaq, Hewlett Packard and Casio.

Handheld Market in Canada, by Vendor, January-July 2001 (as a % of total units sold)



Source: ACNielsen, January 2002

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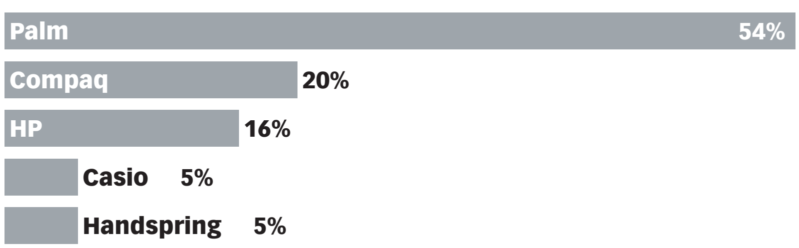
When the market for the more advanced and lucrative color handheld devices in Canada was measured, Palm's lead diminished significantly, with Compaq jumping to second spot by taking a 20% share of PDA sales. Hewlett-Packard's color Pocket PC handhelds took a larger share of the color market as well, with Handspring falling to fifth overall.

Handheld Market in Canada, by Vendor, January-July 2001 (as a % of color units sold)



Source: AC Nielsen, January 2002

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C. PDA Usage and Market Trends

According to a mid-2001 survey conducted by Forrester Research, the majority of North American PDA owners – 76% of respondents – are also regular internet users. Nearly three-quarters of PDA owners feel that technology can improve their lives, and on average, the typical PDA owner has an annual income that is about double that of the average American. Furthermore, more men than women own PDAs.

Profile of North American PDA Owners, 2001

Online	76%
Average income	$72,200
Technology optimists	73%

Source: Forrester Research, 2001

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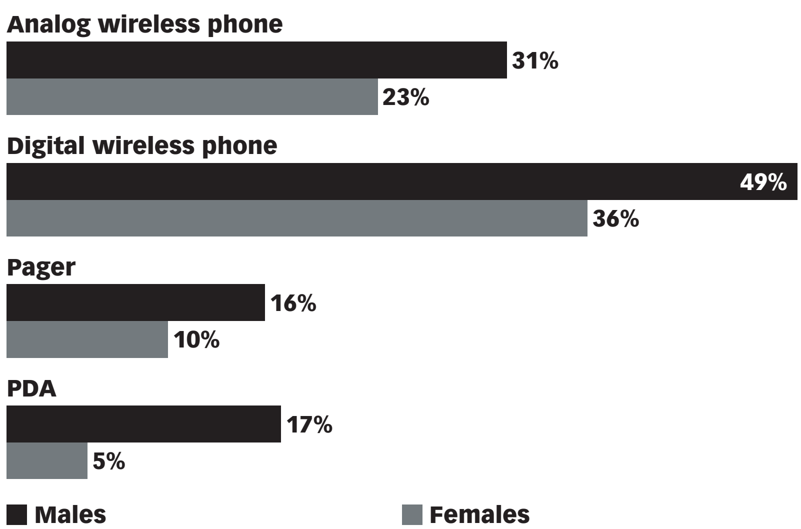
In late 2001, wireless network operator Motient released a survey of more than 5,000 American PDA owners, finding that the majority of users are between the ages of 21 and 40. PDA users between 31 and 40 years of age accounted for 31% of respondents, followed by PDA users between the ages of 21 and 30, representing 28% of respondents.

Yankee Group has found that male PDA users outnumber female PDA users by a ratio of more than three to one. However, it does appear that this gender gap will narrow over time, as PDAs become more widely adopted.

Penetration of Wireless Device by Device and Gender in the US, 2000 (as a % of respondents owning device)



Source: Yankee Group, 2000

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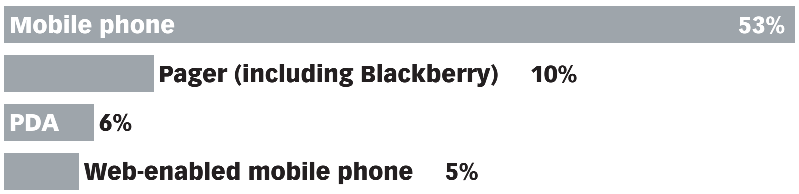
Despite the fact that the United States is the largest market for PDAs in the world, PDA penetration rates in North America are remarkably low compared to those for mobile phones and pagers. Just 6% of the 9,355 Canadian and American households surveyed by Forrester Research had a PDA, compared to 53% of respondents who had a mobile phone.

Mobile Device Adoption in North America, 2001



Source: Forrester Research, 2001

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The Forrester study found that only 3% of North American respondents were using text messaging or e-mail via their mobile devices in mid-2001. Of those respondents that did use mobile data features, 68% said they used their mobile phone, while 13% used their PDA. Just 3% of respondents said they used a Blackberry device.

Online traders and students were the most likely to use a mobile device for data communications, while frequent business travelers were also predisposed to use mobile data communications.

AT Kearney found that 23% of American mobile phone users in its January 2002 survey had an internet-enabled mobile phone, up from 13% of respondents to its year-prior survey.

Percent of US Mobile Phone Users with Internet Enabled Phones, 2001-2002 (as a % of respodents)

Source: A. T. Kearney , February 2002

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The consulting firm went on to find that wireless e-mail usage was declining among mobile device users, as the number of people with internet-enabled phones has increased, while the number of people using their phone's e-mail capabilities has remained constant. This trend is consistent with Europe and Japan as well, where users are not always choosing to take advantage of their mobile devices' e-mail capabilities.

Percent of US Internet Enabled Phone Owners Using E-Mail Capabilities, 2001-2002 (a a % of respondents)

Source: A. T. Kearney , February 2002

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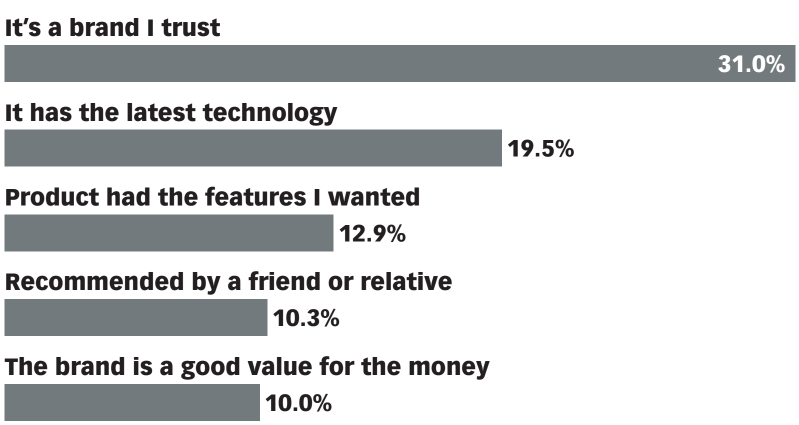
When it comes time for American consumers to purchase a PDA, branding has the largest impact on their decision. According to NPD Intelect, the perceived quality of a PDA vendor's brand is the most important consideration for 31% of consumers, ahead of a PDA's technology or features.

US Consumers' Reasons for Choosing a PDA Brand, 2001



Source: NPD Intelect, 2001

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Price appears to be of lower concern among early adopters of PDAs, which is not surprising since most PDA users have been shown to have relatively high incomes. However, in order to spread to the wider consumer market, average selling prices for PDAs will eventually have to come down.

Indeed, NPD Intelect estimates that the average selling price for mobile phones in the United States was $61 in 2001, and is set to fall to $48 in 2002. By comparison, PDA ASPs were estimated to have been $259 per unit in 2001, according to NPD Techworld.

Average Selling Price of Handheld Devices in the US, 2000 & 2001

Source: NPD Techworld, 2002

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As mentioned previously, the majority of PDAs based on the Palm operating system are less expensive than Pocket PC-based devices. This is partly because Palm devices are less powerful than Pocket PC devices - Pocket PC handhelds typically sport 133 or 206 Mhz processors, while current Palm OS use 16 or 33 Mhz Motorola Dragonball series of processors. It is also due to the fact that fewer Palm devices have color screens, and they typically have less random access memory (RAM) than Pocket PC devices. However, Palm OS 5, to be released later this year, will move the Palm platform to faster ARM-compliant processors and offer features comparable to the more advanced Pocket PC hardware.

It should be noted that Palm's average PDA prices were also lower than Compaq's due to Palm's wider offering of high and low-end PDA devices.

Average Retail Selling Price of PDAs in the US, by Operating System, August 2001

Source: NPD Intelect, 2001

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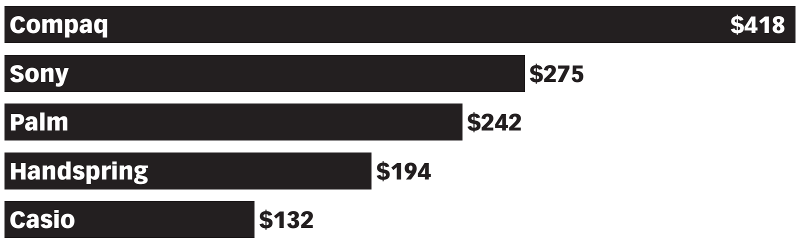
Gartner Dataquest predicts that the average selling price of color Pocket PCs will fall to about $370 per unit by the end of 2002.

Because Casio sells PDAs based on the Pocket PC platform, it is surprising that NPD Intelect finds Casio to have the lowest average selling price of any brand in the US. This can be explained, however, by the fact that Casio sells a line of less-expensive organizers, with few features beyond address books and calculators that are not comparable to Palm OS or Pocket PC PDAs.

Average Selling Price of PDAs, by Brand , August 2001



Source: NPD Intelect, 2001

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Palm's latest i705 device, with its always-on access to wireless data and e-mail/instant messaging capabilities, has debuted in February 2002 at $449 per unit. The i705 provides users with full web-browsing capabilities as well, and is available with an unlimited wireless data access plan priced at $40 per month through Palm.net.

By comparison, Handspring's Treo - which provides voice capabilities, in addition to all of the wireless data features offered by the Palm i705 – also began to ship in February 2002, priced at $549 per unit. Buyers that purchase a one-year wireless service plan with their device are able to purchase the Treo for $399, however.

In both cases, the early versions of these Palm and Handspring devices do not have color displays, but rely upon monochrome displays instead.

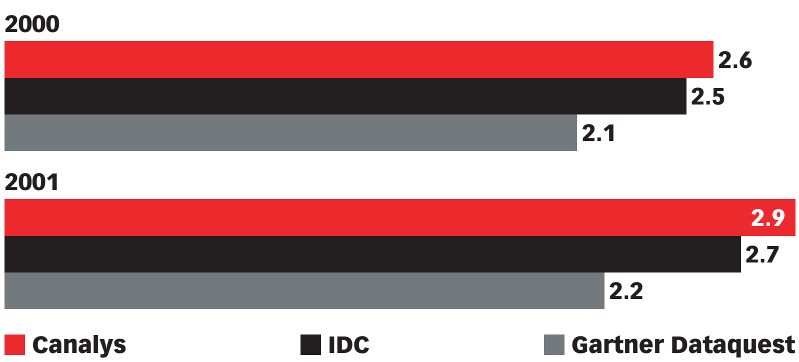
And finally, Nokia's smartphone, the 9290 Communicator, is scheduled for release in North America during the spring of 2002. It will be priced between $600 and $700, and offer all of the same features as the i705 and Treo. Although the 9290 Communicator has been criticized for its larger size, it does have a color display.

A. Market Forecast and Growth Rates

Personal digital assistant sales in Europe are considerably lower than in the United States, and according to most observers, are expected to remain so for the foreseeable future. Gartner Dataquest estimates that Western European sales accounted for 16.5% of worldwide PDA shipments in 2001, or 2.2 million units. The Asia-Pacific PDA market passed Europe for the first time in 2001, accounting for 17.4% of worldwide unit sales.

Research firm Canalys estimates that PDA sales in Western Europe grew at a rate of 11.5% in 2001, while IDC's comparative estimate places the growth rate for European PDA unit sales at 8.0%. Both Canalys and IDC include smartphones such as Nokia's Communicator in their definition of handheld devices.

Comparative Estimates: Handheld Device Shipments in Western Europe, 2000 & 2001 (in millions of units)



Source: eMarketer; various, as noted, 2002

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Although eTForecasts has the most conservative estimate for Western European PDA unit sales in 2000 at 1.9 million units, the US-based research firm predicts that PDA sales in Europe will increase by a compound annual growth rate of 25.4% between 2000 and 2006, to achieve annual sales of 7.5 million units within the next four years.

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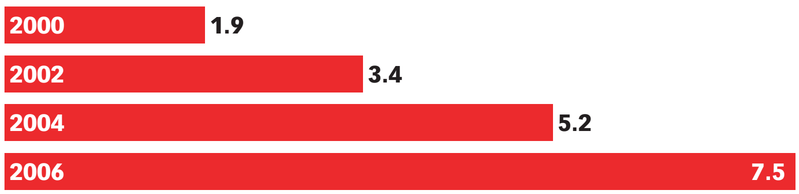
As part of its analysis, eTForecasts believes that Symbian-based PDA-phones (smartphones) will play a significant role in stimulating demand for PDAs in Western Europe, while it also notes that Pocket PC devices have experienced strong sales during the course of 2001.

PDA Unit Sales in Western Europe, 2000, 2002, 2004 & 2006 (in millions)



Source: eTForecasts, 2001

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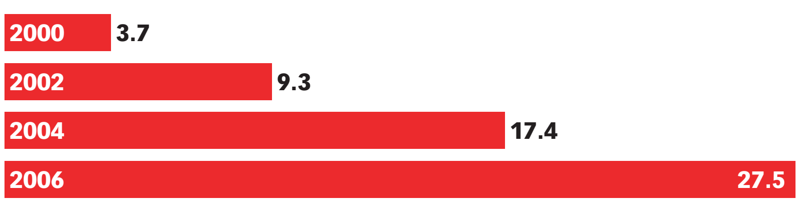
Compared to the sale of handheld devices, mobile phone sales in Western Europe are estimated to have exceeded 166 million units in 2001. Gartner Dataquest has gone on to predict that the installed base of mobile phones will reach 260 million units by the end of 2002.

According to eTForecasts, the installed base of PDA units in Western Europe will increase by a compound annual growth rate of 39.5% between 2000 and 2006, to reach 27.5 million units. Compared to other world regions, however, eTForecasts estimates that Europe will trail both the United States and the Asia-Pacific region, which will have as many as 68.3 million and 55.2 million PDAs in use respectively, by 2006.

PDAs In Use in Western Europe, 2000, 2002, 2004 & 2006 (in millions of units)



Source: eTForecasts, 2001

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When mobile device shipments are broken down by category, Canalys estimates that PDAs will account for about 65% of all mobile device sales in Western Europe, while smartphones will have the second largest market share, with 23.6% of unit sales in 2002.

By 2003, smartphones are expected to have increased their market share in Europe, to account for 38% of all handheld sales. In turn, the market share for PDAs is forecast to fall to 43.5% of unit sales.

Mobile Device Shipments in Western Europe, 2000-2003 (in millions of units)

Device	2000	2001	2002	2003
Feature phone	0.3	0.4	0.5	2.0
Smart phone	0	0.2	1.7	5.6
Handheld/PDA	2.2	3.3	4.7	6.4
Wireless handheld/PDA	0	0.1	0.3	0.6
Total	**2.5**	**3.9**	**7.2**	**14.7**

Source: Canalys, 2001

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However, it is fair to say that sales of handheld devices in Europe are rather difficult to predict. It remains to be seen how European consumers will react to devices that use the Pocket PC 2002 operating system. According to IDC, Compaq's latest PDAs only became available in the European retail channel in late December of 2001, while the previous generation of the Pocket PC had been very well received in Europe.

And although it has been noted that Nokia's smartphones managed to carry their third quarter momentum into the final quarter of 2001, Nokia is only starting to run into new competition from Handspring's convergent Treo device, as well as Palm's newly-released i705 – both of which offer robust wireless data features, although Palm's device does not have voice capabilities.

Canalys estimates that as of the fourth quarter of 2001, 20% of handheld devices sold in Europe had integrated wireless capabilities.

B. Market Share of Leading Vendors

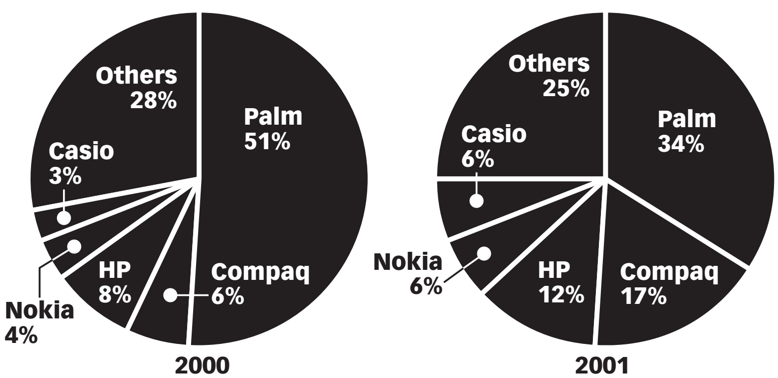
In 2002, leadership of the European market for handheld devices appears to be up for grabs, as the release of new products by different manufacturers has caused quarterly swings in leading vendors' market share.

According to data from Canalys, Nokia had the largest share of the European handheld device market in the third quarter of 2001, thanks to the release of its 9210 Communicator device. But Nokia dropped to third place in the market during the fourth quarter, as aggressive price-cutting by Compaq and Hewlett Packard helped boost sales of their PDAs in the fourth quarter, while Palm regained its position as market leader, thanks to strong holiday sales of its low-end PDA units.

Just as it has come under competitive pressure in the United States, Palm's substantial lead in the European PDA market has been considerably diminished over the course of 2001. IDC estimates that Palm's market share has fallen from 51% of handheld device sales in 2000 to 34% of unit sales in 2001.

Meanwhile, Compaq and Casio have seen their market share increase by 179% and 107% respectively in 2001, as their devices that run on the Pocket PC operating system have been well-received by European consumers. Nokia has also seen significant growth, with its unit sales increasing by 82% in 2001.

Handheld* Market Share in Western Europe, by Vendor, 2000 & 2001



*Note: * includes PDAs and Smartphones*
Source: International Data Corporation (IDC), January 2002

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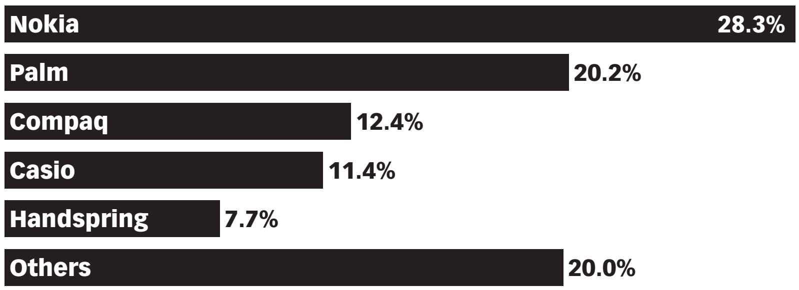
Thanks to its strong distribution channel and a substantial marketing campaign, the release of Nokia's smartphone was a tremendous success. Sales of the 9210 Communicator propelled Nokia to become the leading vendor of handheld devices in Europe during the third quarter of 2001, in a tough market that saw overall unit sales fall 16% from the year-prior quarter.

Western Europe Handheld Device* Market Share, by Vendor, Q3 2001



*Note: *includes smart phones with organizer/pda features*
Source: Canalys, 2001

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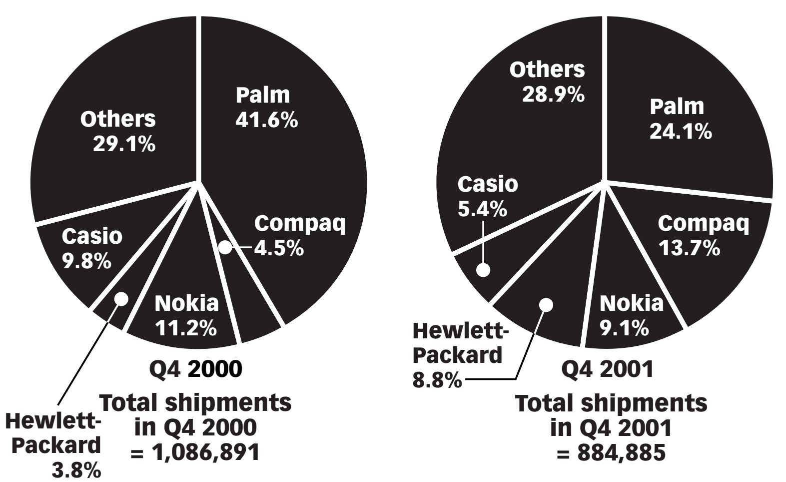
Nokia's third quarter lead was short-lived however, as Pocket PC vendors Compaq and Hewlett-Packard aggressively cut prices on their older PDA models, in order to clear out inventory for the newer Pocket PC 2002 PDAs that arrived late in the fourth quarter. According to IDC, sales of Hewlett-Packard's next-generation devices met with "outstanding" results in the United Kingdom.

Handheld Device Market Share in Western Europe, by Vendor, Q4 2000 & Q4 2001



Source: Canalys, 2002

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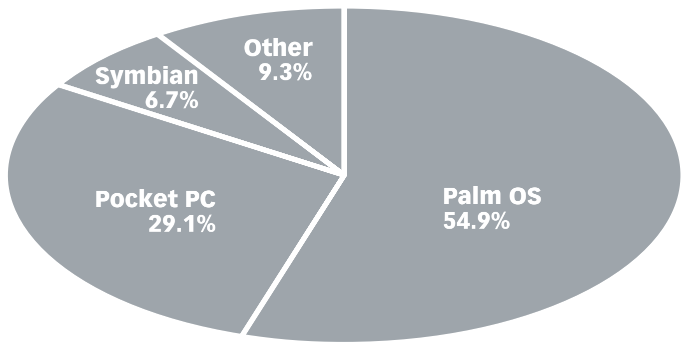
Although Nokia dropped to fourth place in the European handheld market by IDC's estimates, the research firm noted that Nokia's year-over-year sales increased by 58% in the fourth quarter, as smartphones gained greater acceptance throughout Europe.

Indeed, the success of Nokia's 9000 series of smartphones has in turn helped the Symbian operating system gain market share in Europe. Canalys estimates that 6.7% of handheld devices sold during the third quarter were running the Symbian system, while Palm's OS held its substantial lead at 54.9% of all unit sales.

Handheld Device Market Share in Western Europe, by Platform, Q3 2001



Note: Total- 324,538
Source: Gartner Dataquest, 2001

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The strength of the Pocket PC operating system as a consumer favorite is confirmed by fourth quarter data, as Canalys noted that it was the only operating system to see year-over-year growth throughout 2001.

Handheld Device Market Share in Western Europe, by Platform, Q4 2000 & Q4 2001

	Q4 2001 shipments (thousands)	Market share	Q4 2000 shipments (thousands)	Market share	Y/Y Growth
Palm OS	382.9	43.3%	549.6	50.6%	-30%
Pocket PC	246.6	27.9%	132.4	12.2%	86%
Symbian	124.7	14.1%	207.1	19.1%	-40%
Other	130.7	14.8%	197.8	18.2%	-34%
Total	**884.9**	**100.0%**	**1,086.9**	**100%**	**-19%**

Note: includes feature phones, smart phones, handhelds and wireless handhelds
Source: Canalys, 2002

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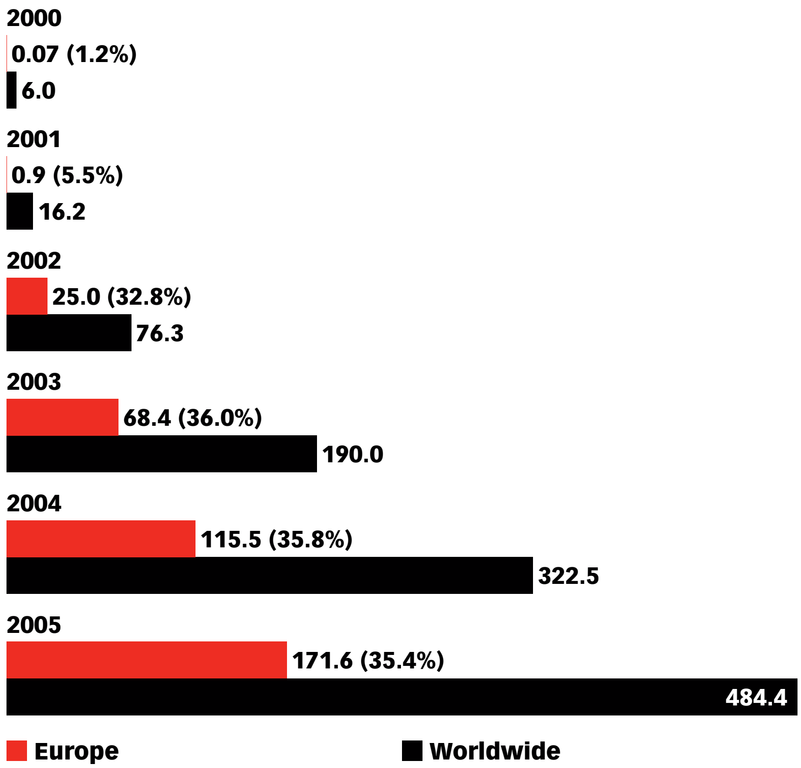
C. PDA Usage and Market Trends

The strength of European mobile communications is widely known throughout the world, so it should come as no surprise that as wireless internet access begins to take root there, Europeans are expected to account for more than one-third of all users worldwide.

European Wireless Internet Users as a Percentage of Wireless Internet Users Worldwide, 2000–2005 (in millions and as a % of total)



Source: Ovum, 2000

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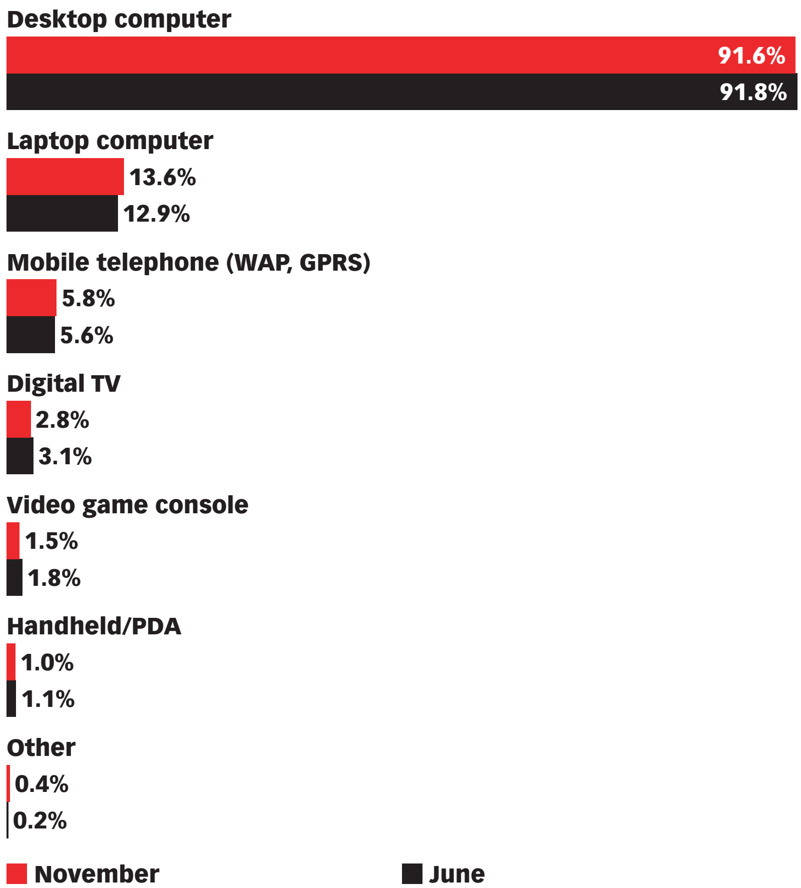
Among the factors contributing to Europeans' preference for mobile internet access, are low household PC penetration rates, as well as home internet access fees that charge users by the minute.

According to Nielsen//NetRatings, less than 50% of households in Germany, the United Kingdom and Italy owned a PC in 2001, while PC penetration rates in France and Italy were barely above one-third of all households. By comparison, about 65% of North American homes owned a PC last year.

Nonetheless, for more robust internet access, most Europeans that do have internet access at home rely upon their personal computer as their primary means of access. While 5.6% of respondents use a mobile phone to connect to the internet, just 1.1% of internet users in the European Union use a PDA for internet access from home, according to a mid-2001 Eurobarometer survey.

Home Internet Access in the EU, by Access Device, 2001



Note: multiple responses accepted
Source: Eurobarometer, January 2002

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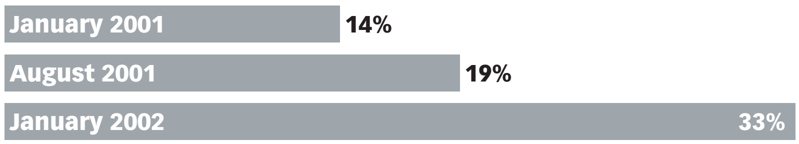
In a more recent survey conducted by AT Kearney, internet-enabled mobile phones accounted for 33% of all mobile phones used in Europe, as of January 2002 – up from 14% of mobile phones one year before.

Percent of European Mobile Phone Users with Internet Enabled Phones, 2001-2002 (as a % of respondents)

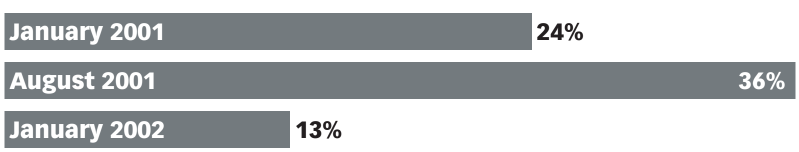


Source: A. T. Kearney , February 2002

However, as in the United States and Japan, the percent of internet-enabled phone owners making use of their devices' e-mail capabilities is declining. Despite the fact that a growing number of internet-enabled phones are being sold to consumers, the absolute number of Europeans making use of e-mail features has remained relatively constant. On the other hand, AT Kearney's survey shows that an increasing number of respondents are accessing news, sports or weather information via their mobile devices.

Although the study did not provide further details as to why new owners of internet-enabled phones are not making use of wireless e-mail capabilities, it could be a combination of a lack of consumer interest in paying extra fees for wireless internet access via their mobile phones, a preference for sending brief SMS messages rather than lengthier e-mails, or the general preference among mobile device owners for using voice rather than data communications.

Percent of European Internet Enabled Phone Owners Using E-Mail Capabilities, 2001-2002 (as a % of respondents)



Source: A. T. Kearney , February 2002

Indeed, the top feature that European wireless internet users like to use on their mobile phones is the short messaging service (SMS). SMS can typically be included as a part of most users' basic mobile voice services package, while e-mail capabilities that rely upon internet-based transmission of data are part of costlier wireless internet packages.

IDC estimates that 30 billion such messages are sent on a monthly basis between users in Europe, compared to just 176 million e-mail messages that were sent via mobile phones in the United States during all of 2001.

Mobile Internet Application Penetration in Western Europe, 2001

Source: Strategy Analytics, October 2001

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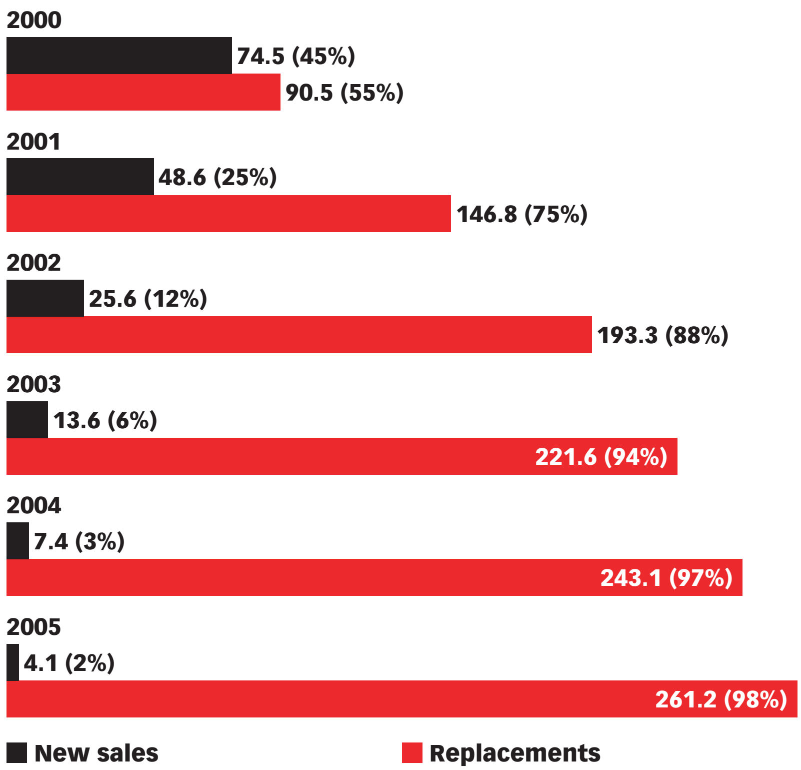
It is worthwhile to note however, that very few convergent handheld devices started providing wireless internet access until the latter half of 2001, as smartphones only became widely distributed in the autumn of 2001, while Palm and Handspring launched devices with wireless data capabilities in early 2002.

As might be expected, the ubiquity of mobile phones in Europe presents a significant problem for PDA vendors in the region, making the sale of a second portable device a tough job indeed.

But if there is an opportunity for PDA vendors to make inroads into the European mobile phone market, it may come at the moment when users choose to replace their mobile phones with a next-generation handheld device. As the Yankee Group's estimates from 2000 show, about 88% of mobile phone purchases in Western Europe will be for replacement devices in 2002.

Cellular Handset Sales in Western Europe, by New and Replacement Phones, 2000-2005 (in millions of units and as % of total sales)



Source: Yankee Group, 2000

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Although it will be difficult to convince consumers to abandon their mobile phones in exchange for PDAs, PDA vendors may be able to win some customers who are looking to adopt next-generation, convergent voice-data devices. Without question, future PDA-phones will become increasingly competitive with those devices offered by smartphone vendors.

On the other hand, mobile phone manufacturers in Europe will of course be prepared to vigorously defend their market share, as they increasingly go head to head with PDA vendors selling convergent voice-data devices.

A. Market Forecast and Growth Rates

As with Western Europe, the market for personal digital assistants in the Asia-Pacific region is smaller than that of the United States. However, many accounts suggest that PDAs may have a better future in Asia than they will in Europe.

According to Gartner Dataquest, PDA unit sales in Asia surpassed those of Europe during 2001, to take a 17.4% share of the global market. PDA sales in Japan accounted for a further 8% of worldwide unit sales, bringing the regional total to just over 25% of global PDA sales.

On the other hand, just as in Europe, mobile phones in Asia are generally more capable than their US counterparts, offering competitive text messaging and other advanced data features. Furthermore, PDA usage in Asia has in the past been hampered because the operating systems of both Palm and Microsoft did not have the ability to offer Chinese or Japanese language capabilities until the middle of 2001.

Now that this latter problem is resolved, Gartner Dataquest estimates that PDA unit sales in Asia will nearly triple during the next three years, to reach sales of 3.9 million units in the entire region, outside of Japan.

PDA Shipments in the Asia-Pacific Region, 2001 & 2004 (in millions of units)

Note: excluding Japan
Source: Gartner Dataquest, May 2001

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Sales estimates by IDC and eTForecasts range from a low of 4.0 million PDAs to a high of 6.2 million units to be sold in Asia during 2002.

By comparison, IDC predicts that PC unit sales will come in at just under 24 million units for the Asia-Pacific region during 2002.

Comparative Estimates: PDA Shipments in the Asia-Pacific Region, 2000-2002 & 2004 (in millions of units)

	2000	2001	2002	2003	2004
eTForecasts	3.1	–	6.2	–	9.9
Gartner Dataquest*	–	1.4	–	–	3.9
International Data Coporation (IDC)*	–	2.9	4.0	–	–

*Note: *excluding Japan*
Source: eMarketer, 2002; various, as noted, 2001

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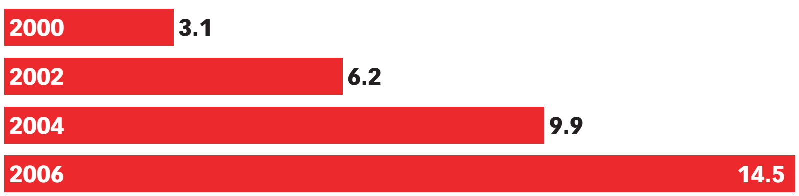
eTForecasts' more optimistic projection goes on to predict sales of 14.5 million PDA units in Asia by 2006, as they increase by a compound annual growth rate of 29.7% between 2000 and 2006. Like eTForecasts, IDC believes that PDA sales will grow faster in the Asia-Pacific region than in any other part of the world. However, IDC predicts an even higher CAGR of 60% between 2000 and 2005.

PDA Unit Sales in the Asia-Pacific Region, 2000, 2002, 2004 & 2006 (in millions)



Source: eTForecasts, September 2001

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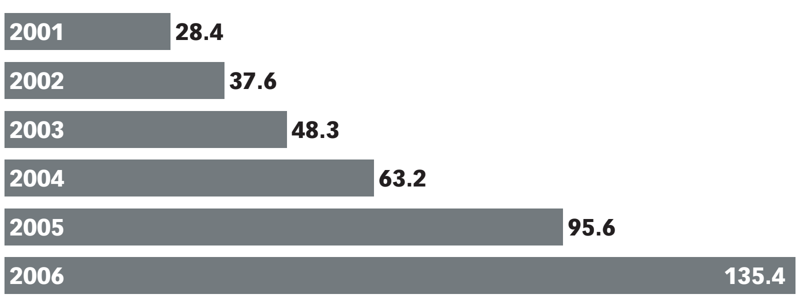
Datamonitor's forecast numbers for the Asian handheld device market are larger than other research firms because of the inclusion of smartphones in its definition of handheld devices. The UK-based research firm estimates that sales of handheld devices in Asia will reach 135.4 million units by 2006.

Handheld Device Shipments in the Asia-Pacific Region, 2001-2006 (in millions of units)



Source: Datamonitor, 2001

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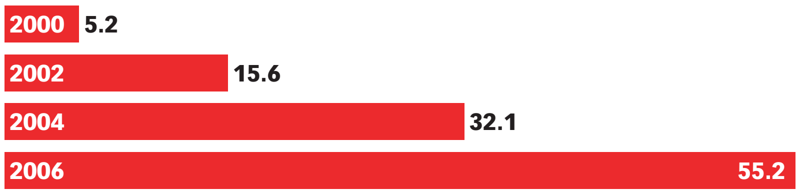
As for the installed base of PDAs in Asia, eTForecasts predicts that this will grow by more than tenfold between 2000 and 2006, to reach 55.2 million units.

PDAs in-Use in the Asia-Pacific Region, 2000, 2002, 2004 & 2006 (in millions of units)



Source: eTForecasts, September 2001

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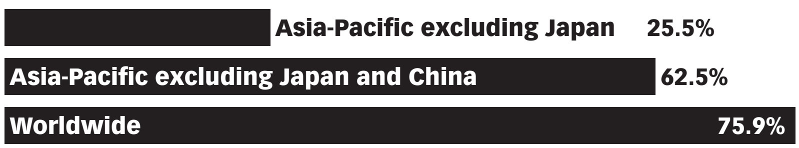
By comparison, according to the EMC World Cellular database, there were more than 330 million mobile phone users in the Asia-Pacific region in 2001.

B. Market Share of Leading Vendors

Until mid-2001, both Palm and Microsoft had been hampered by the lack of native support for Asian languages and character sets in their PDA operating systems. As a result, the Palm and Pocket PC platforms combined for a lower market share of PDA unit sales in Asia than in any other world region, while domestic handheld device vendors in China and Japan had greater success selling devices that relied upon their own proprietary operating systems.

It should therefore come as no surprise that PDAs based on the Palm OS platform accounted for only one-quarter of all Asia-Pacific PDA unit sales in 2000. However, when China and Japan are excluded from the regional total, it is interesting to note that the Palm OS accounted for over 60% of the Asian market – not far off its average share of the worldwide market.

Palm Platform Market Share in the Asia-Pacific Region and Worldwide, 2000



Source: International Data Corporation (IDC), May 2001

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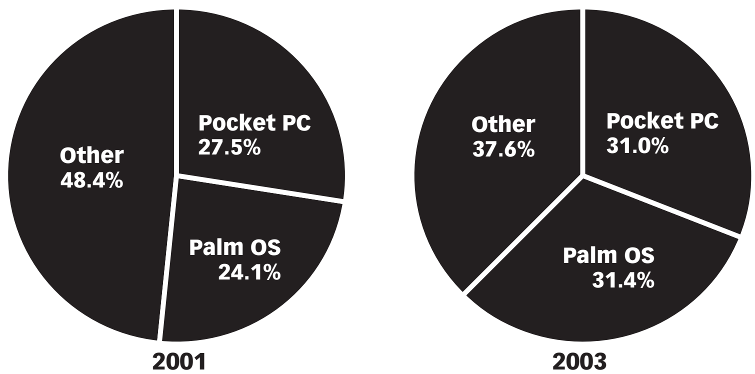
In the second half of 2001, both Microsoft and Palm finally released localized versions of their operating systems for China and Japan, while it only took until October 2001 for Acer to release its first Chinese-language Palm OS device.

IDC estimates that Microsoft and Palm accounted for just over half of all operating systems that were sold by PDA manufacturers during 2001, but forecasts that the "big two" will increase their share to nearly two-thirds of the market by 2003, now that they have native language capabilities. Other operating systems will maintain a significant 37.6% of the market, however.

PDA Shipments in the Asia-Pacific* Region, by Platform, 2001 & 2003



*Note: *excluding Japan*
Source: International Data Corporation (IDC), 2001

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To date, the Chinese market for PDAs has remained rather small, with sales of just 562,000 units in 2001 according to Gartner Dataquest. The three leading PDA vendors in China are all local manufacturers – Hi-tech Wealth, Minren and Legend.

"Most of the popular PDAs in China now use proprietary Chinese-language operating systems."
- Manny Lopez, International Data Corp. (IDC), Hong Kong

Despite the early strength of domestic manufacturers, Gartner goes on to predict that other global vendors such as Palm, Handspring, and Compaq will begin to take a larger share of China's PDA market by 2004.

PDA Market in China, 2001 & 2004 (in thousands of units)

Source: Gartner Group, September 2001

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Such a pattern has already developed in Japan, where the PDA market was led by Sharp and Casio in 2000, while Palm and Handspring were not considered to be significant players. Native language support was the single most important factor behind the US-based manufacturers' absence, as Sharp, Casio and NEC offered products based on proprietary operating systems that provided Japanese support.

Top Four Handheld Device Makers by Market Share, in Japan, 2000

Source: Morgan Stanley Dean Witter Internet Research, 2000

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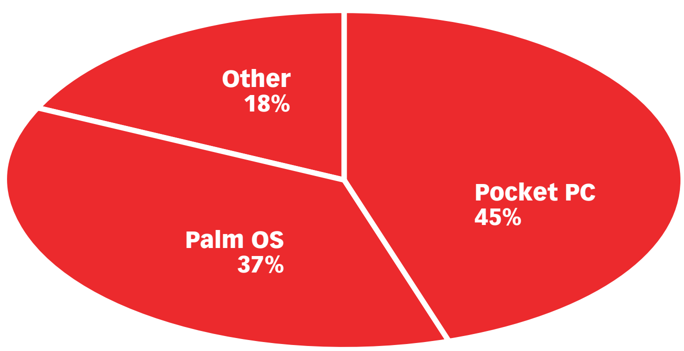
However, in 2001 the Yano Research institute found that Japanese consumers were quick to adopt Palm- and Pocket PC-operated devices once they became available, as both software providers' solutions rocketed to take a combined 82% market share by the end of the year.

PDA Shipments in Japan, by Platform, 2001



Source: Yano Research Institute, November 2001

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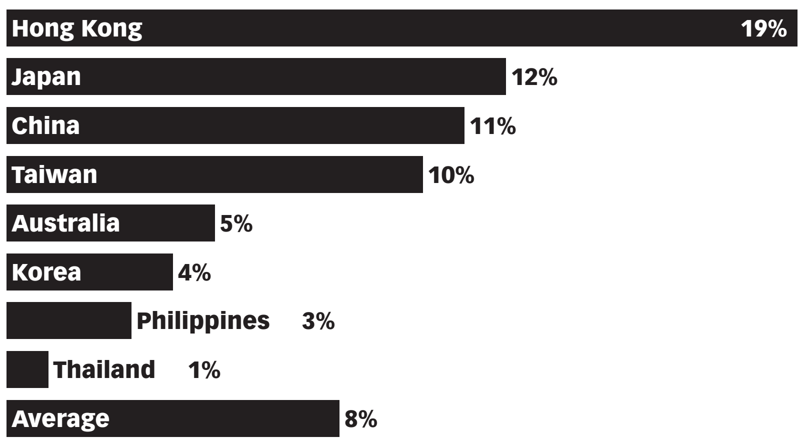
C. PDA Usage and Market Trends

According to a mid-2001 survey of more than 9,300 North American households, Forrester Research found that 6% of respondents owned a PDA. By comparison, Taylor Nelson Sofres found that an average 8% of 15 to 65 year-olds in the Asia-Pacific region owned a PDA by early 2001.

High adoption rates in Hong Kong and Japan helped boost the region's overall average, while 5% of Australians and 4% of South Koreans said that they owned a PDA. The survey sampled 8,164 adults across eight countries, with Chinese respondents taken from the urban centers of Beijing, Shanghai and Guangzhou.

Adults* Who Own PDAs in Selected Countries in the Asia-Pacific Region, December 2000 - February 2001 (as a % of respondents)



*Note: *ages 15-65*
Source: Taylor Nelson Sofres, May 2001

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Despite the apparent interest in PDAs among Asian consumers, the availability of wireless application protocol (WAP) phones and other advanced mobile devices makes them a competitive alternative to PDAs in the Asia-Pacific region. In early 2001, penetration rates for both mobile and WAP phones far exceeded those of PDAs among technology users in all countries.

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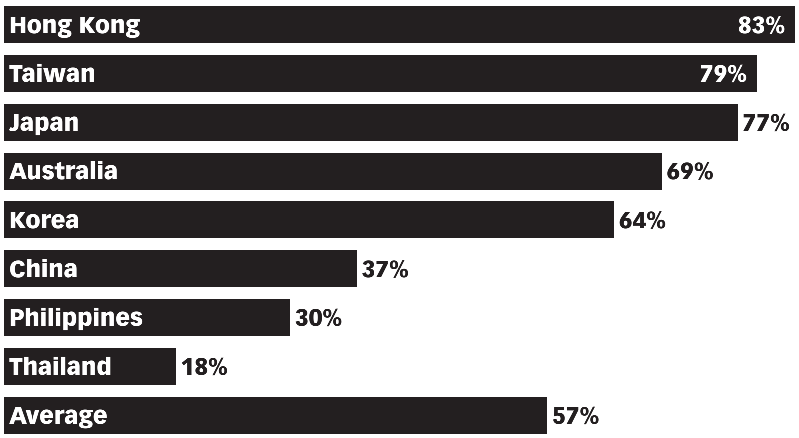
In total, 28.7% of survey respondents in Asia owned a WAP phone, while nearly 3,800, or 46.5%, of respondents said that they owned a mobile phone.

Adults* Who Own Mobile and WAP Phones in Selected Countries in the Asia-Pacific Region, December 2000 - February 2001 (as a % of respondents)



*Note: *ages 15-65*
Source: Taylor Nelson Sofres, May 2001

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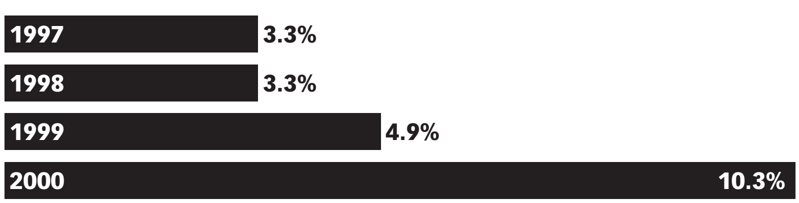
Taylor Nelson Sofres' survey results were not far off those in Japan, where 10.3% of the 6,400 households surveyed by the Japanese Ministry of Posts and Telecommunications were found to own a PDA in 2000. By comparison, Nomura Research Institute found that 13.8% of the Japanese population used the internet on a mobile phone in 2000, with more than one-half of respondents using mobile internet access exclusively. NTT DoCoMo reported 19.8 million i-mode subscribers in early 2001.

In mid-2001, NetRatings reported that 13.4 million people in Japan access the web through some kind of mobile device, with 5.8 million of those mobile web users relying exclusively upon their wireless internet connection. Wireless data access, such as the use of text messaging, was not included as part of the NetRatings study.

Personal Digital Assistant (PDA) Penetration Rate in Japan, by Household, 1997-2000 (as a % of respondents)



Source: MPHPT Information and Communications Policy Bureau, November 2000

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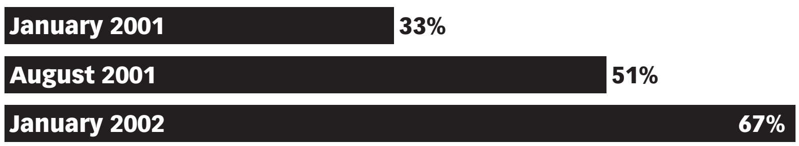
More recently, AT Kearney found in its bi-annual survey of mobile phone users that 67% of respondents in Japan had internet-enabled phones in January 2002. This compares with 29% of mobile phone users in the rest of the Asia-Pacific region, and 33% of respondents in Japan one year before.

Percent of Japanese Mobile Phone Users with Internet Enabled Phones, 2001-2002 (as a % of respondents)



Source: A. T. Kearney , February 2002

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AT Kearney went on to find that the percent of Japanese internet-enabled phone owners that made use of their phones' e-mail features was declining, following the same trend as in Europe and the United States, albeit with a much slower decline. As of January 2002, 70% of internet-enabled phone owners in Japan made use of mobile e-mail capabilities, compared to 20% in the rest of Asia and 13% in Europe.

Percent of Japanese Internet Enabled Phone Owners Using E-Mail Capabilities, 2001-2002 (as a % of respondents)

Source: A. T. Kearney , February 2002

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As in Western Europe, where text messaging and wireless data services are very popular, consumers in Asia have also been using mobile phones with these capabilities for quite some time. Indeed, PDAs will be a tough sell in the Japanese market for handheld devices, largely due to the astounding success of i-mode wireless phones, which offer advanced wireless data services.

On the other hand, as mentioned previously, PDA vendors still have an opportunity to gain market share at the expense of mobile phone manufacturers, if they are able to capture new customers as consumers upgrade to next-generation, convergent voice-data devices.

Due in part to the level of economic development of several countries in the region, the market for PDAs is significantly smaller in Latin America than in other parts of the world. With 2001 per capita GDP of just $8,130 in Argentina, $3,989 in Brazil and $5,757 in Mexico, compared with $38,107 for the United States, it is not surprising that PDAs remain out of reach for most people in the region. IDC estimates that a mere 680,000 units were shipped in Latin America throughout 2001.

Although the absolute number of PDA units sold in Latin America is lower than in other parts of the world, growth rates for PDA sales are substantial. According to IDC, shipments of handheld devices have nearly doubled on a year-over-year basis during the past two years, and are expected to experience a compound annual growth rate of 70% through 2005.

PDA Market in Latin America, 2000 & 2004 (in millions)

Source: International Data Corporation (IDC), January 2001

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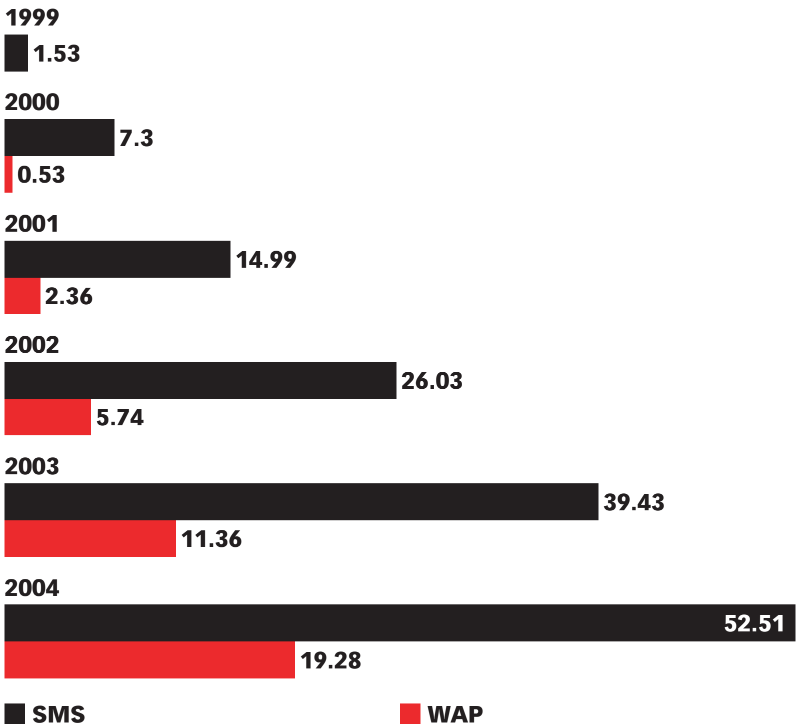
For a relative comparison, Banc of America Securities estimates that 8.8 million PC units will be sold in Latin America by the end of 2002. Gartner Dataquest estimates that there were 71.9 million mobile phone users in Latin America in 2001, and as one further comparison, eMarketer estimates there will be 22.1 million internet users in Latin America by the end of 2002.

As for the broader use of mobile phone technologies, IDC estimates that in 2001 there were nearly 15 million people in Latin America who had SMS capabilities via their mobile phones. A further 2.3 million people had WAP-enabled phones in Latin America by the end of last year, while this number is forecast to grow to 19.2 million people by 2004.

Mobile Phone Users in Latin America, by Technology, 1999-2004 (in millions)



Source: International Data Corporation (IDC), 2001

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PDA buyers in the region are sensitive to price, and have therefore tended to buy devices that run on the Palm operating system, as opposed to the more expensive Pocket PC units.

IDC has gone on to note that Palm has made successful inroads into the enterprise market in Latin America, where companies in Brazil, Mexico and Argentina are using PDAs as part of sales or other customer-facing initiatives.

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A. Enterprise Market for PDAs

In early 2002, personal digital assistants and related handheld devices are already used in many businesses, often having first been introduced by individual users, rather than corporate IT departments. Most large enterprises currently provide some level of support to such users who want to synchronize their handheld devices with their desktop computers, while other companies have been using wireless data devices for a few years, such as Blackberry e-mail pagers.

Research in Motion, for example, claims that its Blackberry device is used by about 6,500 organizations in North America.

The Meta Group estimates that between 20% and 25% of large organizations in the United States are supporting office applications on handheld devices, while the Giga Information Group estimates that about one-third of its enterprise customers are using handheld devices in early 2002. An additional one-third of its clients are expected to be using handheld devices within the next year.

In-Stat/MDR predicts that the number of individual wireless data users will grow seven-fold from 6.6 million American corporate users in 2001 to 39.0 million by 2006.

Number of US Business Wireless Data Users, 2001 & 2006 (in millions)

Source: Cahners In-Stat/MDR , 2002

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The research firm goes on to predict that revenues for wireless data service providers are expected to reach $16 billion within the next four years.

Estimated US Business Wireless Data Services Revenues, 2001 & 2006 (in billions)

Source: Cahners In-Stat/MDR , 2002

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"Experts say that most companies are waiting for the technology to catch up with their needs, before taking an expensive plunge into wireless."

– Lou Hirsh, Wireless NewsFactor.com

On the other hand, Wireless NewsFactor reports that many companies do not believe that PDAs offer enough capabilities – in terms of software capabilities or security – in order to justify enterprise-wide deployments in the near term. Many large companies have furthermore put wireless initiatives on hold as a result of the economic slowdown, and still do not have the necessary infrastructure in place to support wireless data services.

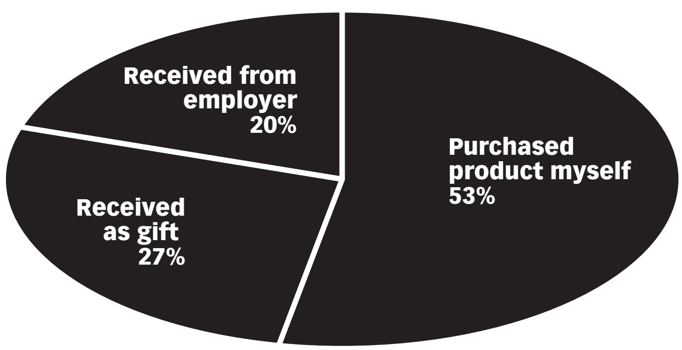
"IT managers don't see [PDAs] as mission-critical because of the economy."
– Barney Dewey, senior partner at Andrew Seybold Group

Indeed, according to Morgan Stanley's December 2001 survey of corporate CIOs, wireless initiatives, which include PDA deployments, were ranked as the 23rd priority out of 51 alternate IT spending initiatives that were planned by Fortune 1000 firms for 2002.

In the short term then, the enterprise market for PDAs will likely remain relatively slow until businesses decide to embrace wireless data technology. As business investment in wireless initiatives picks up, and as handheld device capabilities improve, observers seem to believe that the corporate market for handheld devices will begin to see significant growth in 2003 and 2004.

According to the Consumer Electronics Association, just 20% of PDA users in the United States said that they had received a PDA from their employer by the end of 2001. The majority of PDA users had purchased their device themselves, or received them as a gift.

How US PDA Users Acquired Their Device, 2000



Source: Consumer Electronics Association, 2001

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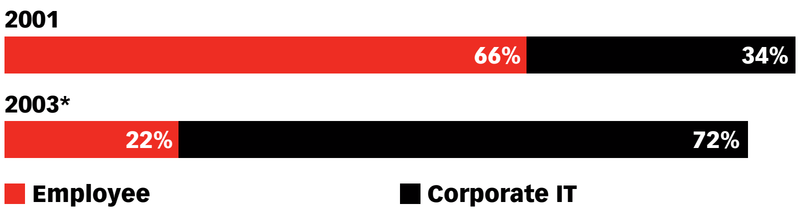
While the deployment of handheld devices has been a low priority for corporate IT departments so far, users have not been deterred from bringing PDAs into the workplace for personal information management or for their own use of corporate data.

Forrester Research found that approximately 34% of the companies it surveyed have purchased PDA devices for their employees, while the remaining 66% had not. By 2003, it is anticipated that nearly three quarters of corporate PDA purchases will be handled by company IT departments.

US Corporate Decision Making for PDA Purchases, 2001 & 2003



*Note: *an additional 6% don't know; based on a survey of 50 US IT managers.*
Source: Forrester Research, 2001

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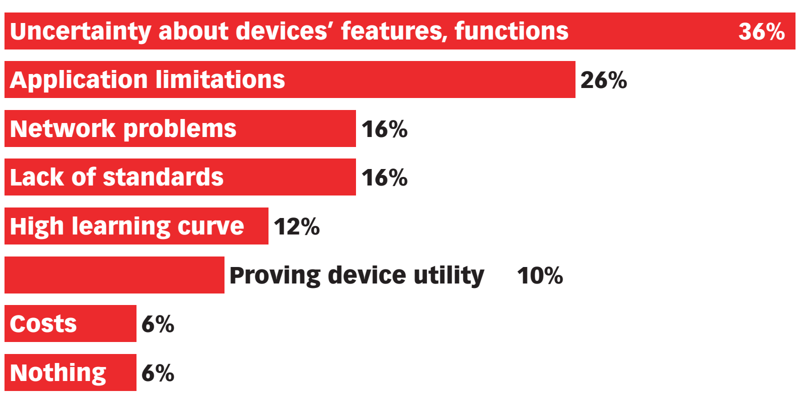
Although it has been suggested that the cost of deploying PDAs has been a leading cause behind slow corporate adoption of handheld devices, Forrester Research found in its survey of 50 IT managers that only 6% of respondents cited cost as a key factor in delaying their company's adoption of PDAs.

Instead, the largest obstacle to implementation was the technological capability of PDAs, as IT managers were either uncertain about device features, or did not believe that PDAs provided adequate software capabilities to justify their deployment.

Barriers to US Corporate Implementation of Handheld Computers, 2001



Note: based on a survey of 50 US IT managers
Source: Forrester Research, 2001

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It does appear that several businesses plan to start spending on mobile device initiatives within the next year, however. In a late-2001 survey of 400 corporate IT managers, Jupiter Media Metrix found that 35% of respondents planned to spend between $500,000 and upwards of $2 million on their companies' mobile applications initiatives by 2003.

A separate survey by the World Information Technology and Services Alliance (WITSA), found that of the 336 international firms that it interviewed, 51% of respondents planned to increase their wireless budgets in 2002, while 41% expected to leave their budgets unchanged. On average, wireless applications budgets were expected to more than double in 2002, to reach an average $680,000, up from $360,000 in 2001.

Average Business Spending on Wireless Applications Worldwide, 2001 & 2002

Source: World Information Technology and Services Alliance (WITSA) , March 2002

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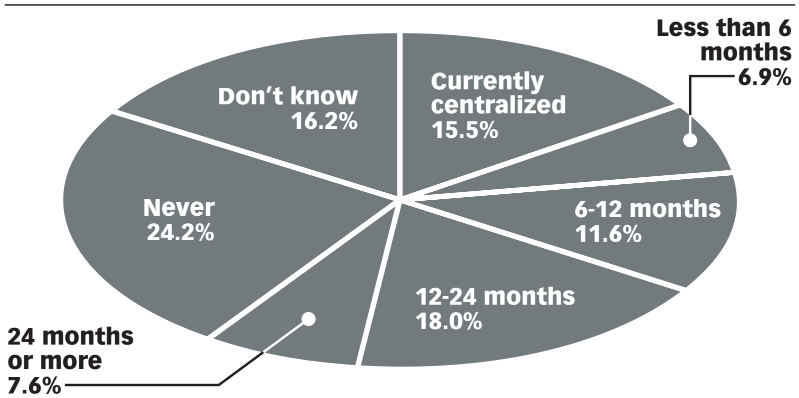
Another survey that was conducted by IDC finds that 52% of business IT managers expect to centralize corporate handheld purchasing and deployment decisions within their company's IT group by the end of 2003. The study went on to note that the widespread adoption of handheld devices among enterprises will not be ready to occur until specific business applications are able to more securely connect handheld devices to corporate intranets and databases.

Corporate Plans to Centralize Handheld Purchasing and Deployment Decsions, 2001



Note: Base: 277 respondents involved in corporate purchasing or IT management at companies with more than 500 employees
Source: International Data Corporation (IDC), 2001

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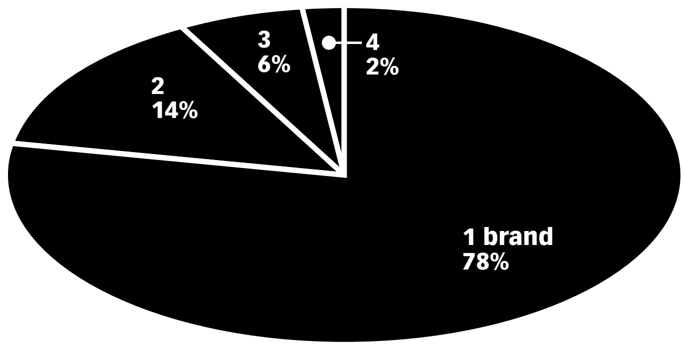
Even though corporate purchasing decisions for PDAs have not yet been centralized, Forrester finds that IT departments are willing to support PDAs within their companies. At least 78% of businesses are able to support at least one brand of PDA, while an additional 22% of companies are able to support multiple vendors' PDAs.

Number of PDA Brands Supported per Company among US Enterprises, 2001



Note: based on a survey of 50 US IT managers
Source: Forrester Research, 2001

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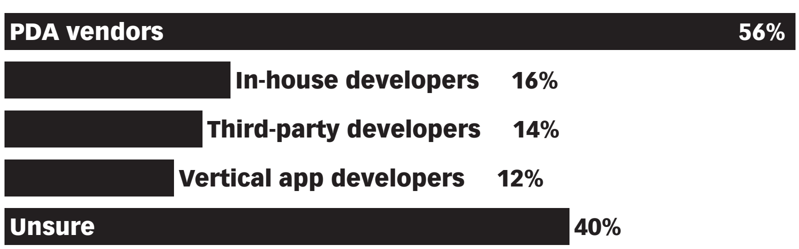
The Forrester Research survey also suggests that by 2003, 56% of IT managers expect to rely upon handheld software solutions provided by PDA vendors. A few companies plan to develop their own handheld business applications, or turn to other third party developers, although most businesses would presumably use such solutions alongside vendors' applications.

Expected Suppliers of Handheld Business Applications to US Enterprises, 2003



Note: multiple responses accepted; based on a survey of 50 US IT managers
Source: Forrester Research, 2001

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As in the consumer market for PDAs, adoption among enterprises will be based upon the needs of handheld device users. For basic data management or mobile communication needs, businesses will likely turn to low-end devices that are less expensive and more ruggedized, or durable. Warehouse employees, retail clerks, or municipal bylaw enforcement officials might be expected to receive such devices, as well as mobile sales representatives.

On the other hand, professionals, real estate agents, or mobile sales representatives who require advanced data transmission and processing capabilities will likely receive higher-end handheld devices. Cahner's In-Stat estimates that 23% of workers at large and medium-size businesses in North America may be considered mobile workers, spending more than 20% of their time outside of the office.

Although devices that run on the Palm operating system appear to have an early lead among enterprise users, many industry observers believe that Microsoft's Pocket PC operating system has an advantage over the long term. First among its strengths is the interoperability of the Pocket PC OS with Microsoft's Windows OS, which is installed on the vast majority of desktop and portable PCs used by most enterprises.

Analysts have also pointed out that for more complex applications and multimedia usage, the Pocket PC is already considered to be the better handheld operating system. On the other hand, for basic personal information management or low-end use, Palm is a less expensive alternative.

In a late-2001 survey of more than 1,100 IT managers, IDC found that 20% of the companies it surveyed had standardized on the Palm OS platform, with an additional 10% of respondents planning to standardize on the Palm OS platform within the next year. More than 60% of the companies surveyed already supported the Palm OS, compared to about one-third of companies that supported the Pocket PC OS.

Momentum appears to be building behind the Microsoft OS, however. According to a February 2002 estimate by Gartner Dataquest, approximately 80% of Pocket PC-based PDAs were purchased either by organizations, or by people who were later reimbursed by the organization that they work for.

IDC predicts that corporate support for the Pocket PC platform will expand from 35% of companies in 2001 to 53% of businesses by 2002.

Corporate Support for Pocket PC, 2001 & 2002

Note: based on a survey of 1,100 corporate customers
Source: International Data Corporation (IDC), 2001

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Despite predictions of its eventual also-ran status, Palm is pursuing aggressive plans to remain competitive in the enterprise market. One of its first steps was to develop an Ethernet-based cradle that allows users to synchronize their PDAs with their PCs over an office network. Palm's release of the i705, a wireless-enabled handheld device that offers access to corporate e-mail, in addition to basic wireless internet capabilities, is also a key part of its business market strategy.

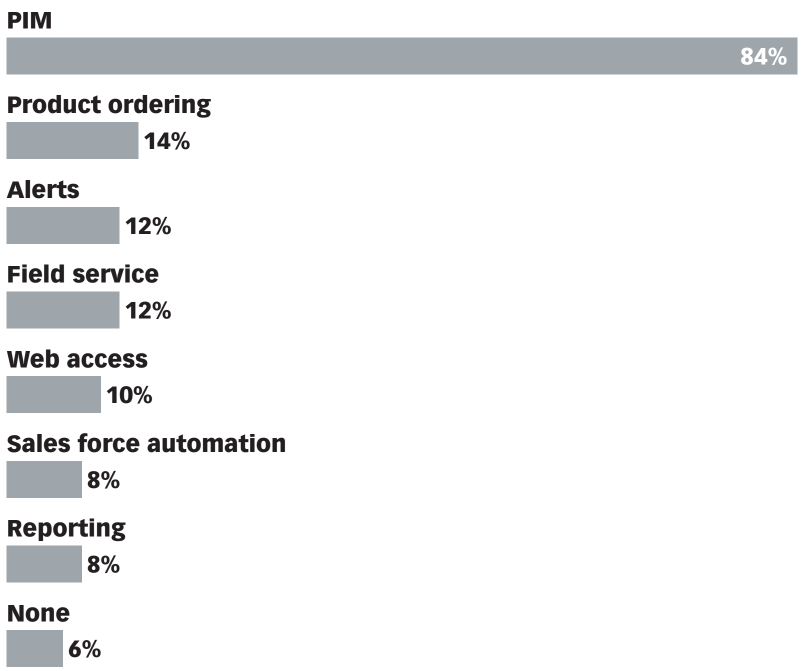
Besides Palm, Handspring has also stepped-up its efforts to target enterprise customers as of mid-2001. In addition to the release of its convergent Treo device in early 2002, Handspring is looking forward to the latest version of Palm's operating system, due out in the summer of 2002, which is expected to strengthen both manufacturers' competitive position vis-à-vis Pocket PC devices.

In another late-2001 survey by the Yankee Group, it was found that among American companies with more than 500 employees, about one-third of respondents expect to use Palm handhelds for their mobile workforces.

B. Trends in Enterprise PDA Usage

Not unlike the consumer market, enterprise users of PDAs have primarily used their handheld devices for personal information management (PIM). Not surprisingly, Forrester Research found that very few companies were using PDAs for mobile communications or commercial transactions in 2001.

Top Corporate Uses for PDAs in US Enterprises, 2001



Note: based on a survey of 50 US IT managers
Source: Forrester Research, 2001

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This is set to change over the next two years, however, as leading PDA vendors have in early 2002 released devices that offer wireless data transmission capabilities, and have ramped up their focus upon the enterprise market.

In its study of the broader enterprise wireless market, WITSA found that 36% of the companies it surveyed in late 2001 supported wireless e-mail access, while an additional 49% of companies planned to provide it in the future. A further 81% of businesses already used or planned to offer wireless access to the internet, and to their companies' intranet.

The Cutter Consortium believes that the percentage of corporations providing remote access to mobile workers via PDAs will increase from 33% of US businesses in 2001 to 89% of companies by the end of 2003. Notably, remote access through PDAs is expected to become much closer to that of mobile phones over the next two years.

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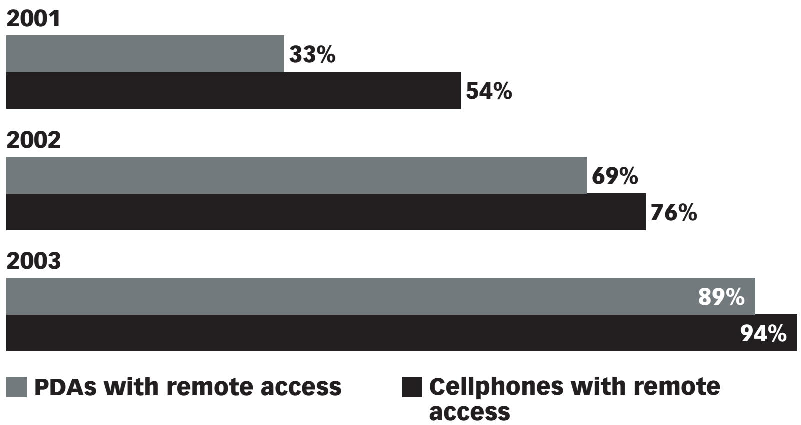
The Cutter Consortium defines the mobile workforce as "workers who are trying to access corporate information away from a physical corporate location."

Use of PDAs and Cellphones with Remote Access in the US, 2001-2003 (as a % of respondents*)



*Note: *50 IT/IS managers took part in the Cutter Consortium survey*
Source: Cutter Consortium, 2001

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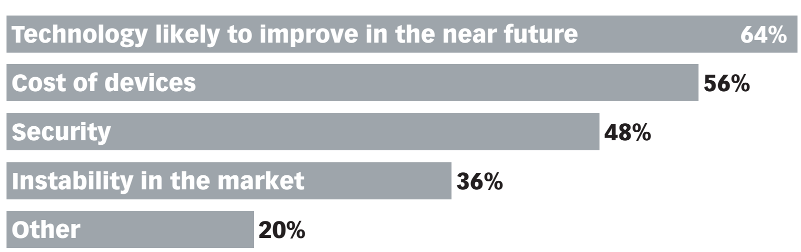
As a point of reference to the use of handheld devices, Cutter estimates that 90% of the remote workforce used notebook computers in 2001, while nearly 100% of the mobile workforce will have a notebook computer with wireless connection by 2003.

The Cutter Consortium has gone on to find that the single most significant barrier to corporate investment in new mobile devices comes as a result of the continued rapid pace of mobile technology development. As might be expected, businesses are reluctant to adopt mobile devices that they believe will become obsolete in a short time, and would prefer to wait until such devices meet their companies' most basic needs.

Price, security, and instability among some mobile device vendors are of concern to IT managers as well.

Barriers to Corporate Investment in New Mobile Devices, 2001 (as a % of respondents*)



*Note: *50 IT/IS managers took part in the Cutter Consortium survey*
Source: Cutter Consortium, 2001

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According to Wirthlin Worldwide, executives believe that their companies' most mobile workers naturally have the greatest need for wireless data capabilities. After the sales force, executives themselves are the most likely candidates to require a mobile device, while manufacturing or administrative support staff are least likely to need a web-enabled phone, or PDA.

Executives Who See a Need for Web-Enabled Phones and PDAs for Various Types of US Workers, 2000

Source: Wirthlin Worldwide, September 2000

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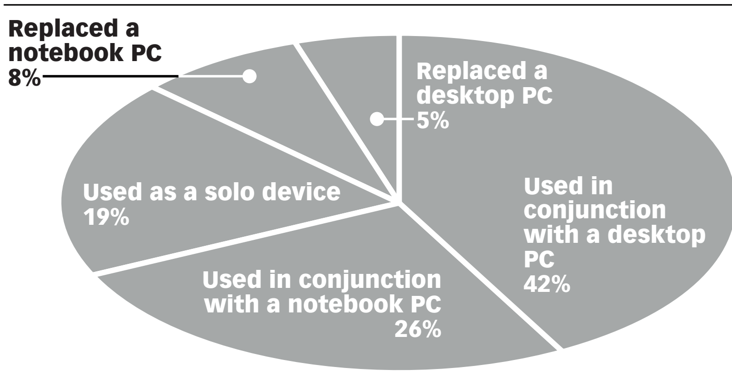
Because the majority of handheld devices have not offered robust wireless data capabilities until mid- to late-2001, most professionals have used these devices in conjunction with their desktop or notebook PCs. Blackberry pagers are of course a notable exception.

In the future, it is likely that executives will continue to use handheld devices as a complementary device to their desktop PCs.

Mobile Professionals' Use of Data-centric Handheld Devices, 2001



Source: ResearchPortal.com, 2001

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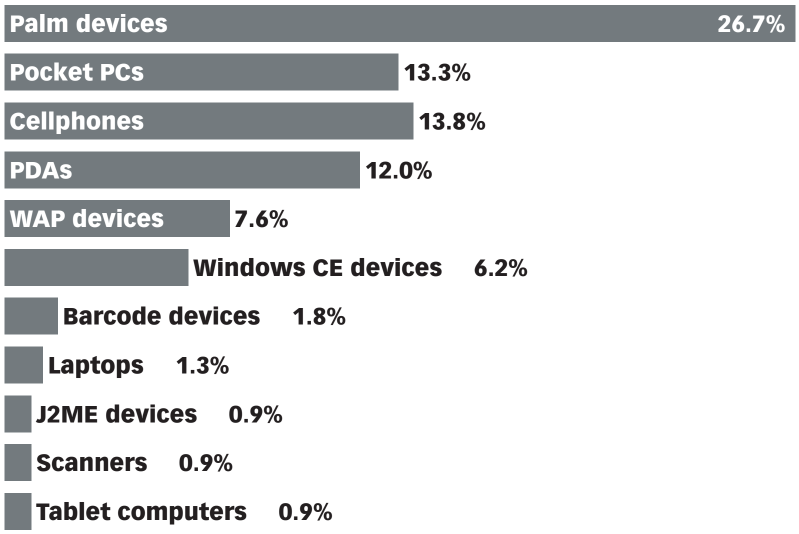
As an indication of how the landscape of remote data access is continuing to evolve, an Evans Data corporation survey of North American database developers found that about one-quarter of respondents were preparing to facilitate database access via Palm devices.

With the head-start that Palm has among business users, it is not surprising that the Pocket PC trailed Palm in mid-2001. This gap will likely be narrowed in the near term.

Mobile Devices that US Database Developers are Targeting with Database Applications, June 2001 (as a % of respondents*)



*Note: *Evans surveyed 600 software developers in North America*
Source: Evans Data Corp., 2001

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The Aberdeen Group lists the health care, insurance and real estate industries as early adopters of wireless handheld devices, in which workers frequently use handheld devices for mobile access to work-related data. Other organizations that are expected to closely follow these industries include those in the government, travel and hospitality sectors of the economy.

The healthcare industry has been an early adopter of handheld devices in part because physicians have found PDAs to be very helpful for information management and reference. According to a survey by Harris Interactive, about one-quarter of physicians in the United States are regular users of handheld devices, while 18% of physicians consider them to be an integral part of their everyday practice.

The Proportion of All US Physicians Who Use Handheld Devices, 1999 & 2001

Source: Harris Interactive, 2001

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One such device is manufactured by Epocrates, a partner of Palm that sells repackaged devices that come preloaded with a database of clinical medical information. Doctors find these handheld databases to be extremely useful as a pocket-sized resource that can replace a number of medical reference books. Data is conveniently provided on Epocrates devices in a searchable, indexed form.

Although just 1% of physicians said they used a handheld device for transactions in 2001, this figure is expected to rise to 20% of physicians by 2004.

For further data about US and Canadian physicians' use of handheld devices, please refer to the eStatDatabase.
http://www2.emarketer.com/account_manager.php

A. Introduction

Wireless internet access represents the fertile middle ground over which mobile phone vendors and PDA manufacturers will become increasingly competitive during 2002. As several convergent voice-data handheld devices have come available to consumers since the latter half of 2001, the market for next-generation mobile devices has only just begun to take shape.

On the one side are vendors of mobile phones, with an installed base of users that exceeds that of PDA vendors by a ratio of more than ten to one.

To compete with voice-enabled PDAs, mobile phone manufacturers have developed smartphones that incorporate basic information management technology, in addition to short messaging, e-mail, and web browsing capabilities. However, it may be argued that few mobile phones truly are "smart"—many lack large displays, the ability to synchronize data with PCs or add third-party applications, and most have limited text entry capabilities that rely upon awkward numeric telephone keypads.

On the other hand, although PDAs presently contain advanced data management technology and a wider range of application capabilities, most mobile phones are smaller and less expensive. More importantly, however, is the fact that mobile phones offer voice communication features – the single most important application preferred by mobile device users.

But although consumers have chosen voice capabilities as the most important application for their mobile devices, e-mail and other forms of data-based communication have increasingly become a close second, opening the door to PDA vendors that are able to provide superior data-based communication capabilities.

Enter the current wave of next-generation, convergent mobile devices. Because consumers are for the most part unwilling to carry multiple electronic devices, manufacturers of mobile telephones and PDAs have been driven to the middle ground of voice-data handheld devices, which by many accounts will be the endgame for mobile communications devices.

And because neither mobile phone manufacturers nor PDA vendors have yet established supremacy over this middle ground, much of the market for convergent devices remains up for grabs.

As the technology behind mobile phones and PDAs is developed, what remains to be seen is the extent to which mobile phone manufacturers will be able to provide data applications that can successfully compete with those of handheld computers.

On the other hand, the success of PDA manufacturers will be determined by their ability to add voice communication capabilities, extend their products' battery life, and improve ease of use and portability that can successfully compete with those capabilities of mobile phones.

B. The Early History of Convergent Devices

In 1999, mobile phone manufacturer Qualcomm released the PDQ SmartPhone, which was essentially a handheld device that offered the organizational capabilities of a Palm III PDA, combined with a mobile phone. Although the big, clunky device got some positive reviews, few people actually purchased it because of its high price.

Two years later, at the beginning of 2001, Kyocera released an updated version of the SmartPhone, which was one of the earliest hybrid phone-PDA devices. Despite its $500 retail price, the device received significant consumer interest upon its release, with retailers reporting that they could not keep enough units in stock.

Indeed, by the end of 2001 several of the first viable convergent devices had finally arrived. These devices have so far proved to be wildly popular among avid technology users, despite the fact that they are significantly larger and more expensive than either mobile phones or PDAs.

In general, there are two separate approaches that manufacturers are taking as they develop convergent devices. Some manufacturers, such as Kyocera, Samsung, and Handspring are integrating voice features into a PDA device, using the Palm operating system. On the other side, mobile phone manufacturers such as Nokia and Ericcson are integrating PDA features into voice-centric mobile phones, using the Symbian OS.

The result so far has been to create comparably sized products with minor differences between their user interfaces. For example, the Samsung i300 does not have a traditional telephone keypad but an LCD-based keypad instead, while the Kyocera, Nokia and Ericcson products feature traditional keypads, that flip away to reveal an LCD screen. Similarly, the Handspring Treo has a built-in keyboard, as well as an LCD screen that permits users to dial telephone numbers.

All devices provide wireless e-mail and instant messaging, in addition to voice and web-browsing capabilities.

Convergent Handheld Devices Available in the US and Europe, 2001

Company	Product	OS	Memory	Network	Design	Release
Kyocera	QCP 6035 Smart phone	Palm	8MB	CDMA	flip out keypad 7.34 oz	1/01
Samsung	i300	Palm	8MB	CDMA	color PDA 6oz	5/01
Handspring	Visor Phone	Palm	–	GSM 1800	Springboard module	12/00
Handspring	Treo 180	Palm	8MB	GSM 1800	Clamshell	2/02
Nokia	9290	Symbian	16MB	GSM 1900	Color Flip-over keyboard 8.6 oz	3/02
Nokia	9210	Symbian	16MB	GSM 900	Color Flip-over keyboard 13.9 oz	6/01
Ericsson	R380 Smartphone	Symbian	8MB	GSM 900/ 1800	Flip-out keypad 5.8 oz	1/01

Source: eMarketer, Company Reports, 2001

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It is worthwhile to note that two handheld device manufacturers are conspicuously absent from the preceding table. Palm, whose operating system already powers a number of convergent devices, has yet to release its own convergent product. Instead, Palm's entry into the wireless PDA market has so far come in the form of the i705 – a device that does not have voice capabilities, but does provide always-on e-mail and access to wireless internet applications.

The other exception is Microsoft, whose Pocket PC platform has yet to form the basis for a convergent device. Besides its Pocket PC 2002 platform, which offers wireless capabilities for PDA-based handhelds, Microsoft has also released its Smartphone 2002 platform, which is designed for mobile phones. Convergent devices based on this platform are expected to become available from hardware manufacturers later in 2002.

Among the family of early convergent devices, perhaps the most eagerly anticipated device has been the Handspring Treo. Based upon the Palm operating system and offering connectivity to GSM standard wireless networks, the Treo has a miniature keyboard that provides users with a similar level of data-entry functionality as the Blackberry wireless e-mail device.

The Treo has begun to ship in February of 2002, and its reception among users is expected to provide the clearest sign yet of the long-term direction of the market for convergent devices.

"[Handspring is] a company that is transitioning out of the organizer business and into the communicator business." *– Donna Dubinsky, CEO Handspring*

However, the entire landscape of this emerging market will not be fully apparent until convergent devices that run the Pocket PC platform eventually become available.

One early preview of the battle for consumers is already shaping up between Handspring's Treo and Nokia's Communicator devices, which are available in both Europe and North America. The second quarter of 2002 will be the first full quarter in which both manufacturers' convergent devices will compete directly with one another in the marketplace, with unit sales for these devices expected to be closely watched.

As the functionality of phones, wireless email devices, and PDAs begins to overlap even further, the market for mobile communications devices will be transformed over the next two to three years. Eventually, it is anticipated that most wireless phones will have rudimentary (or even advanced) PDA capabilities, while most PDAs will offer basic wireless communication capabilities. This is already the case today, as many simple mobile phones have basic calendar and contact management features.

On the other hand, just because a handheld device manufacturer is able to combine voice, data and other functions within one device, it does not necessarily mean an all-in-one device will be a more compelling product for every consumer.

Indeed, mobile device vendors will instead continue to develop products that offer different features, and then target them at separate markets. It remains to be seen whether basic wireless communication features will be included in the majority of devices, just as personal information management features are common today.

"It gets interesting when you can download music to your handset." *– Dan McDonough Jr., NewsFactor*

The convergence of mobile devices and digital music players will likely contribute to the differentiation between the consumer and business markets for handheld devices.

As storage becomes less expensive, integrated digital audio will become a feature that can increase the utility of PDAs at little additional cost. At this point, however, the price of flash memory to store files on current PDAs is too expensive to put inside a device, so that it may be used as an audio player. For now, digital audio on handhelds is limited to voice annotations and quick notes, or short samples of music.

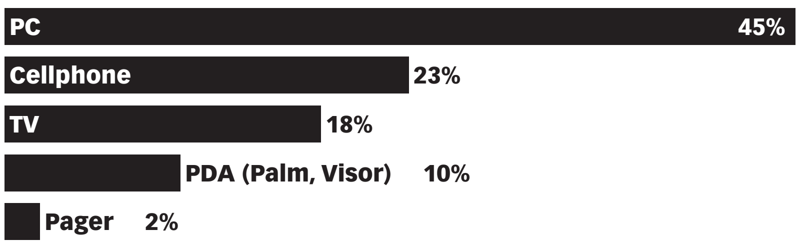
It is worthwhile to note that Pocket PC devices already include a version of Windows Media Player that can play and record audio, while Handspring Visors can be fitted with an MP3 player Springboard module. And Sony sells a version of its Clié device, which can play ATRAC audio.

C. Usage Trends for Mobile Devices

Early demand for personal digital assistants has for the most part remained marginalized among the traditional group of technology early-adopters. As with other new technologies, PDAs are not likely to become widely adopted until their functionality improves, and prices come down. However, thanks to new products that are being released in 2002, the outlook for PDA sales has become more positive than it has been in the past.

When it comes to the broad spectrum of modern technological devices, personal computers ranked number one among avid technology users as the leading device that they could not do without. By comparison, PDAs ranked fourth and were considered to be essential by only 10% of the survey's respondents.

Technological Devices that Avid Technology Users Cannot Live Without, 2001 (as a %*)



*Note: *% are based on answers given by attendees of the TED 11 conference*
Source: Meridia Audience Response, 2001

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A separate Yankelovich Partners survey conducted in early 2001 found that just 30% of surveyed US consumers wanted a PDA, even if cost were not a factor. Mobile phones, on the other hand, were desired by 82% of respondents.

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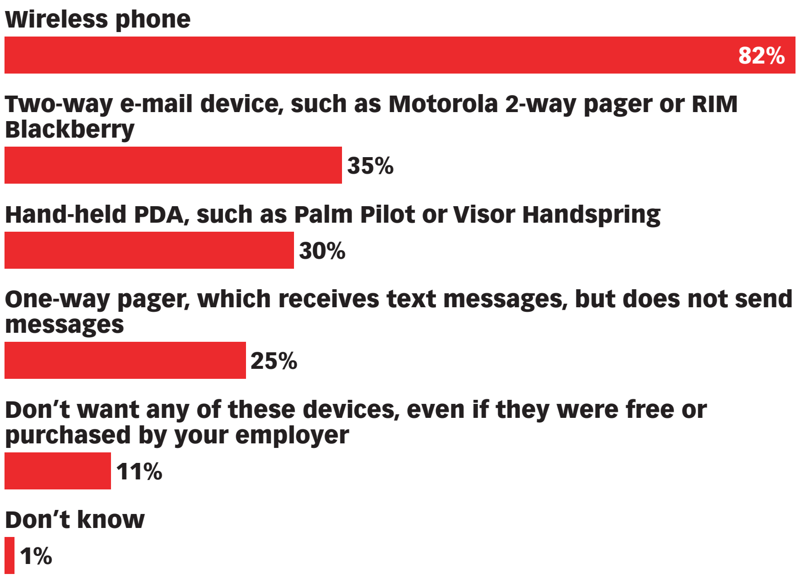
The tepid response to PDAs should be evaluated within the context of the timing of these surveys and the development of handheld devices – most early surveys have not captured consumers' opinions following the release of PDAs that offer wireless access to data, let alone voice capabilities.

Mobile Devices Desired by US Consumers, 2001



Note: multiple responses allowed
Source: Yankelovich Partners, March 2001

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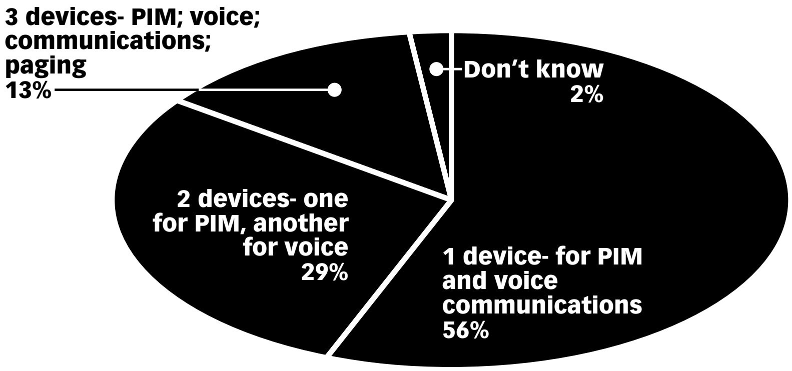
In a study conducted in mid-2000, IDC found that the majority of handheld device users in the United States would prefer to use one single device that combines personal information management (PIM) and voice capabilities. Just under one-third of respondents said that they were willing to accept two mobile devices.

US Handheld Device Users Desires for Carrying Multiple Devices, 2000



Note: n=600
Source: International Data Corporation (IDC) Smart Handheld Devices Survey, 2000

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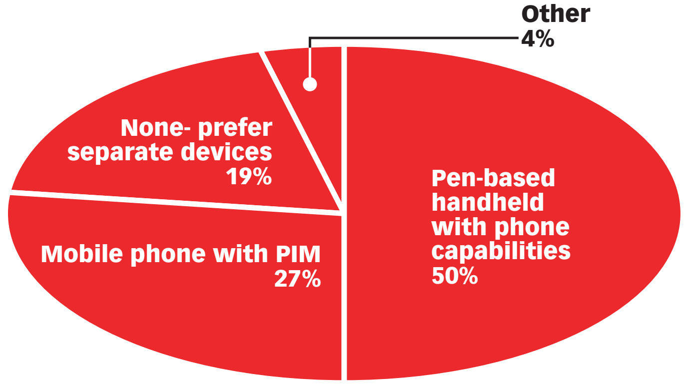
By comparison, more than one-half of the respondents to the Yankelovich Partners survey were willing to carry two or more mobile devices, although only one in four said they would carry 3 or more mobile devices.

When it comes to choosing among multiple mobile devices, the mobile phone usually wins if only one device may be carried, although several users have indicated that they would ideally have both voice and data capabilities.

This is confirmed by another IDC survey from June 2001 that asked mobile device users what type of device they would find most useful. Just over three-quarters, at 77% of respondents, desired a convergent device—either a pen-based handheld with telephone capabilities or a smart phone with PIM capabilities.

More interestingly, it appears that a greater number of US handheld device users would prefer a convergent device derived from a PDA. In January 2002, Cahners In-Stat released the results of its survey of 2,025 people, finding that 50% of respondents wanted a PDA-based convergent device, compared to 27% of respondents who preferred a mobile phone-based convergent device.

US Demand for Convergent Devices, 2001



Note: n=2025
Source: International Data Corporation (IDC), June 2001

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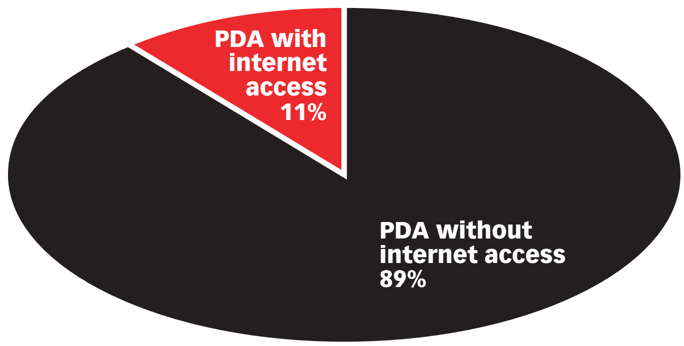
So far, very few Americans have chosen to use their PDAs for wireless internet access. Most users have instead synchronized their PDAs with their PCs in order to download information from the internet, or access and reply to e-mails. Compared to the cost of wireless internet access, which ranges from $40 to $60 per month for PDA users, synchronizing PDAs with one's PC-based internet connection is a much less costly alternative.

Not surprisingly then, the Consumer Electronics Association found that only 11% of US PDA users owned a wireless modem in 2000.

US PDA Owners with Wireless Modem, 2000



Source: Consumer Electronics Association, 2001

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As of the third quarter of 2001, just 11.7% of US wireless internet subscribers used a PDA or similar handheld device to access the internet, with the vast majority relying upon mobile phones for wireless internet access instead.

Wireless Data Subscribers in the US, by Device, 1999, 2000 & Q3 2001 (in thousands)

	1999	2000	Q3 2001
Mobile phone	200	2,887	6,100
Handheld device (PDA, Two-way pager, etc.)	54	532	813
Total	**254**	**3,419**	**6,913**

Source: Morgan Stanley Dean Witter, November 2001

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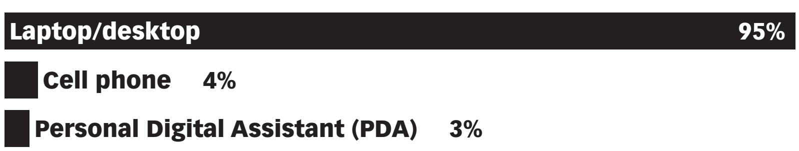
Due to the fact that most PDA users have chosen to access the internet through their PC-based internet connection, the majority have continued to rely upon their personal computers as their primary means of reading e-mail.

It is worthwhile to note that despite the availability of wireless access to e-mail via mobile phones, just 4% of American internet users relied upon their mobile phones to read e-mail.

Devices that US Users Use to Read E-Mail, 2001 (as a % of respondents)



Note: multiple responses allowed
Source: DoubleClick/NFO WorldGroup, October 2001

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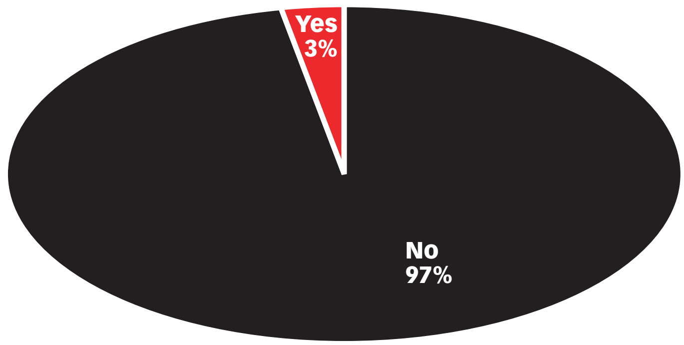
Forrester Research also found in a mid-2001 survey of more than 9,000 North American consumers that the vast majority of people did not use mobile text messaging. The study also noted that only 26% of people who owned a mobile device were interested in having wireless access to data.

US Consumer Usage of Wireless Text Messaging, 2001 (as a % of all consumers)



Source: Forrester Research, 2001

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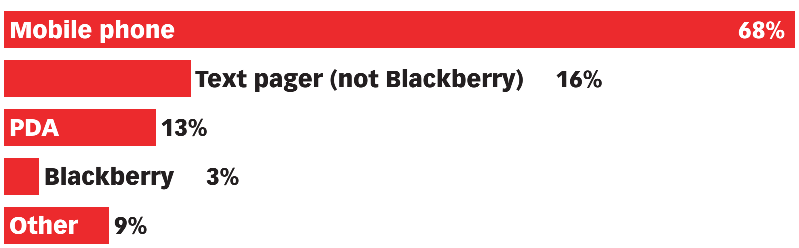
Among the 3% of respondents that did use wireless text messaging, 68% used mobile phones while 13% used PDAs.

Devices Used for Mobile E-Mail or Text Messaging by US Mobile Messaging Users, 2001



Source: Forrester Research, 2001

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So why has wireless e-mail and internet access been slow to catch on in North America? Some observers believe that high PC penetration rates have contributed to consumers' tendency to use either desktop or portable computers for e-mail and instant messaging communications.

Observers have gone on to point out that the limited data-entry capabilities on most mobile devices have been a deterrent for many people as well. Compared to a PC keyboard, users find it to be relatively difficult to key-in text messages on mobile phone keypads and pen-based PDAs. As a result, most internet users find it to be much easier to go online and send instant messages or e-mail from a full-size keyboard.

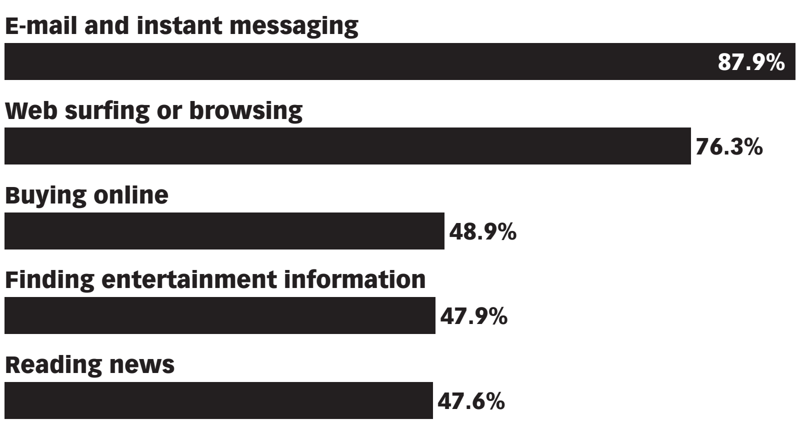
Another deterrent that has in the past kept PDA users from wirelessly accessing data has come from the need for PDAs to use a dial-up modem in order to access the internet, rather than have always-on internet access.

These usage patterns of wireless device owners will likely begin to change in 2002, however, now that Palm and Handspring have released versions of their handheld devices with always-on wireless capabilities. PDAs and smartphones have also developed more robust platforms for managing and entering text-based data. This in turn has led optimists to believe that consumers' wireless internet activity will become more closely aligned with their PC-based patterns of internet activity.

As most surveys have found, PC-based internet users tend to use the internet primarily for communication: e-mail consistently tops every survey about internet use, as the single most popular feature.

According to a late-2001 that was conducted by the UCLA Center on Communication Policy, 87.9% of the more than 2,000 American households surveyed listed e-mail and instant messaging as their top use of the internet.

Most Popular Internet Activities among US Internet Users, 2001 (as a % of respondents)



Source: UCLA Center For Communication Policy, November 2001

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A similar survey conducted by the Pew Internet and American Life Project in January 2002 posted similar results, showing that e-mail was the most popular internet activity, with 95% of US internet users sending and receiving e-mail.

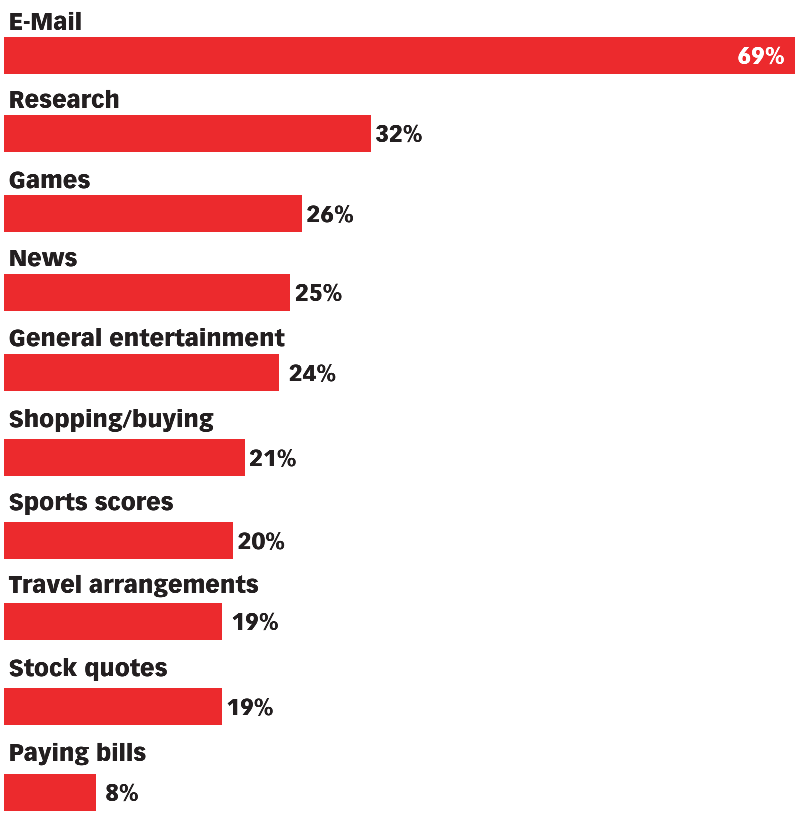
"Wireless e-mail will become the most important [handheld device] application area."

– Gartner Dataquest

Indeed, it is widely anticipated that the PC-based popularity of e-mail will be carried over onto mobile devices in North America. Early surveys show that regardless of the mobile device that is used, e-mail is already the most popular application.

TNS Research found that of the top ten wireless internet activities among Americans in 2001, e-mail was by far the favorite. Research and gaming were the next most popular uses, while online shopping and financial transactions were much lower on the list.

Top 10 Wireless Internet Activities for Wireless Internet Device Owners in the US, 2001 (as a % of owners)



Source: TNS Intersearch, 2001

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IDC predicts that the next two years will see a substantial jump in the number of wireless e-mails being sent in the United States, as service providers continue to roll out their next generation networks and promote wireless messaging. By the end of 2003, IDC estimates that 1.5 billion wireless e-mails will be sent in the US, up from just 176 million in 2001.

Estimated Number of Wireless E-Mails Being Sent in the US, 2001 & 2003

2001	176 million
2003	1.5 billion

Source: International Data Corporation (IDC), 2002

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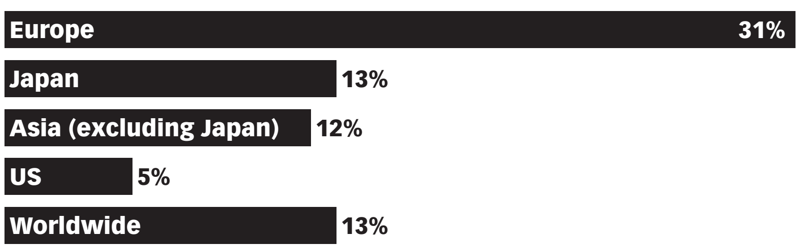
When it comes to the use of internet enabled phones, AT Kearney found in its January 2002 survey of 5,600 mobile phone owners that the use of wireless information services was still in its infancy in the United States. By comparison, about one-third of internet-enabled phone users in Europe were using their mobile devices to access news, sports or weather information.

Percent of Internet Enabled Phone Users Accessing Online News/Sports/Weather, by Region, January 2002 (as a % of respondents)



Source: A. T. Kearney , February 2002

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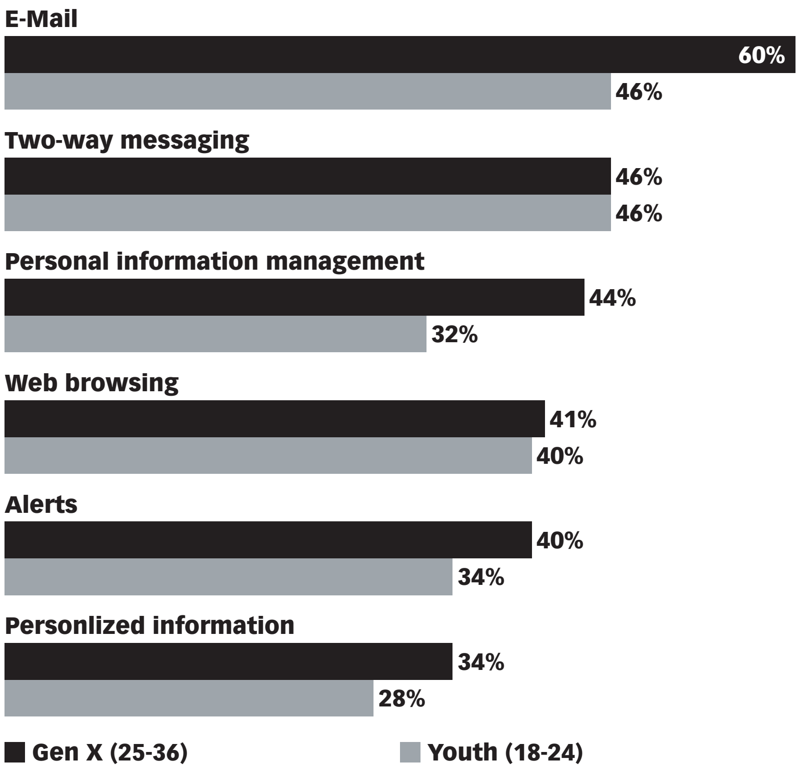
In contrast to their European counterparts, mobile phone users in Japan were more likely to exchange e-mails via their devices, at 70% or respondents to the AT Kearney study, rather than use their mobile phones for accessing news-related information.

As for young adults in the United States, e-mail and text messaging continue to be the most popular wireless data applications in use. Younger adults under the age of 24 are less interested in personal information management features, while adults between the ages of 25 and 36 are more likely to use PIM features, probably as a result of their place in the workforce.

Wireless Data Applications in Use among Young Adults in the US, 2001



Source: Telephia, 2001

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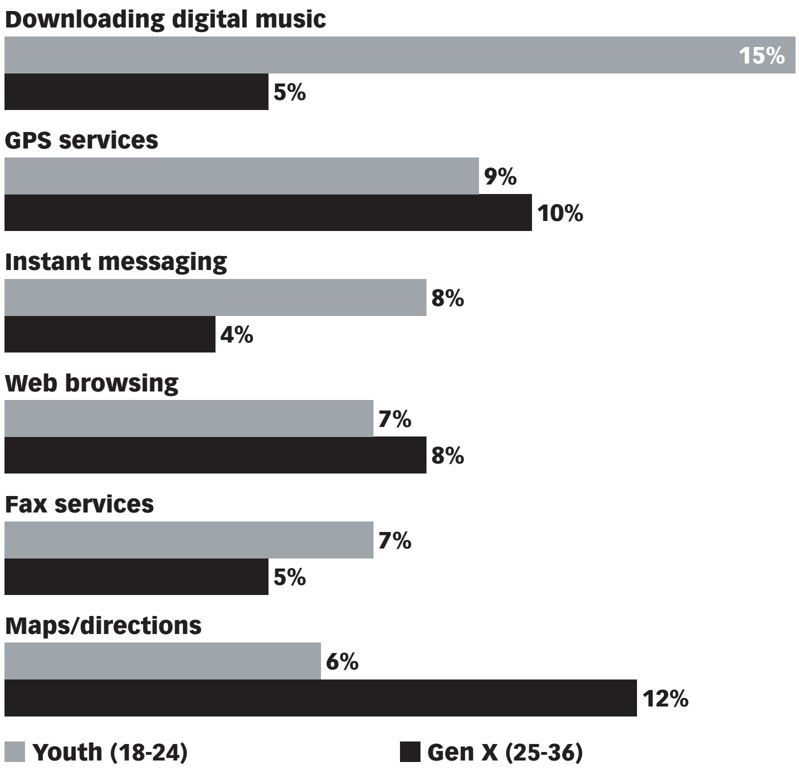
As for those features that young adults would most like to see added to their mobile devices, the ability to download music and global positioning service (GPS) are the most appealing. However, compared to e-mail and text messaging, the demand for these features is considerably lower.

Wireless Data Applications Desired by Young Adults in the US, 2001



Source: Telephia, 2001

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PDA users appear to be more interested in mobile digital audio than their smartphone counterparts, although significant numbers of both groups would like to see digital audio included as part of their mobile devices.

This is one area where device manufacturers will choose to differentiate between target markets, as they add different features to their range of devices. For example, although consumers may be interested in digital audio capabilities, most enterprise customers will probably not buy devices that provide such a feature.

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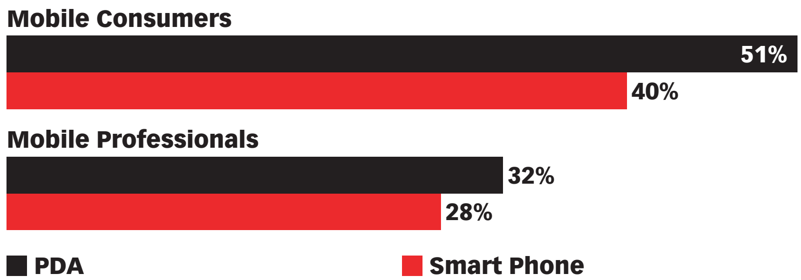
Mobile professionals have also expressed a lower degree of interest in digital audio features than consumers, according to this survey by ResearchPortal.com.

Desirability of Mobile Digital Audio among Current Handheld Device Users, by Handheld Device Type, 2001

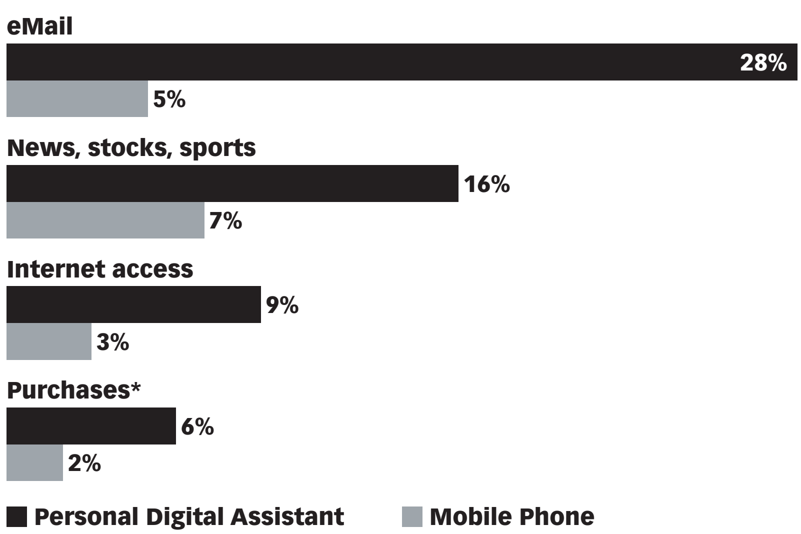


Source: ResearchPortal.com, 2001

When it comes to mobile commerce, Arthur Andersen found in a late 2000 survey that wireless purchases ranked last among mobile device users, revealing either a lack of mobile commerce capabilities on the part of online retailers, or a reluctance to make wireless transactions on the part of mobile device users.

Although mobile phone users in the survey outnumbered PDA users by a margin of 8 to 1, Arthur Andersen went on to find that among the 424 respondents to its survey, PDA owners were the most likely to use their devices for all kinds of internet-based activities.

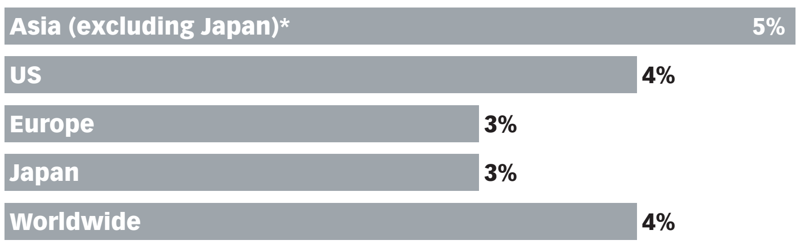
Online Activities among US Wireless Device Owners, Q4 2000



*Note: *Mainly travel reservations and gifts*
Source: Arthur Andersen, Q4 2000

AT Kearney's January 2002 survey of internet-enabled phone users confirms the absence of mobile commerce activity, with just 4% of internet-enabled phone users worldwide making purchases via their mobile devices in early 2002. These results were unchanged in most regions from the year before, when 4% of owners of internet-enabled phones made mobile purchases.

Percent of Internet-Enabled Phone Users Purchasing Online, by Region, January 2002 (as a % of respondents)



*Note: n=5,600 mobile phone users; *includes China, Hong Kong, Korea, Taiwan, Singapore and Australia*
Source: A. T. Kearney , February 2002

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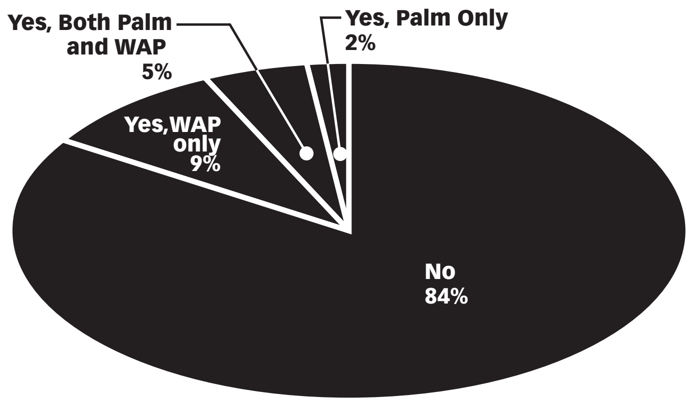
Based upon the findings of the Arthur Andersen study, it appears that PDAs may have an advantage over mobile phones, when it comes to serving customers who desire wireless internet access. On the other hand, convergent mobile phones such as the Nokia 9290 Communicator have adopted a much more capable user interface that should be able to compete very well with PDA manufacturers' offerings.

With few wireless device users prepared to transact online, most internet merchants have not yet developed mobile commerce capabilities for their websites.

In March of 2001, Jupiter Media Metrix found that 84% of the top 100 retail websites were not able to support handheld devices, while ActivMedia Research noted in May of 2001 that just 2% of B2C websites and 9% of B2B websites supported PDA access.

WAP or Palm Availability for Top 100 Web Retail Sites, 2001



Source: Jupiter Media Metrix, March 2001

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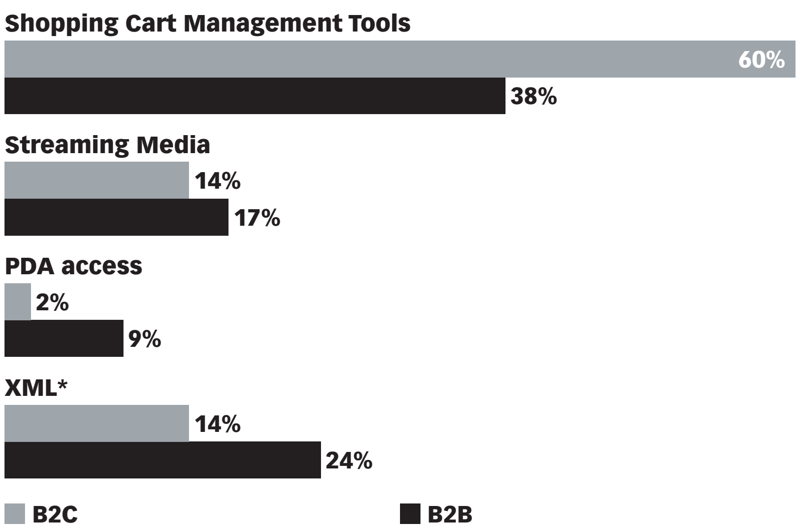
Technology Adoption by E-Commerce Websites, 2001



*Note: *Planned adoption in coming year*
Source: ActivMedia Research, 2001

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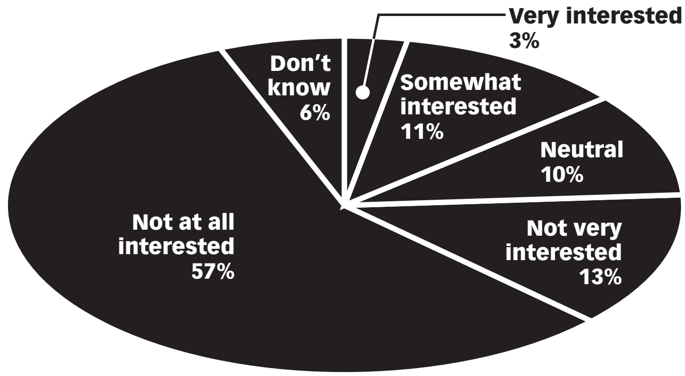
As for online financial transactions, the Yankee Group has found that 70% of US consumers have little or no interest in performing banking transactions using mobile devices. Although this interest may shift over the long term as consumers gain more trust in the security of mobile devices, most people will continue to prefer the communication capabilities that they offer.

US Consumer Interest in Banking Transactions Using Mobile Devices, 2001



Source: The Yankee Group, 2001

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For further information about the market and trends behind other wireless devices, please see eMarketer's North American Wireless Report. http://www.emarketer.com/ereports/wireless_na/welcome.html

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