

VisionBook Series and FLORAPEN: PC Products for Mobile Computing

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Overview: Mobile computing continues its explosive growth in Japan fueled by the deployment of a mobile communications infrastructure supporting data communications coupled with the appearance of powerful new portable terminals based on imaginative new concepts. A robust mobile communications infrastructure is a recent development tracing back to the advent of portable telephones and the Personal Handyphone System (PHS) in 1997. In this emerging environment, Hitachi, Ltd. has come out with a lineup of cutting edge of PC-based portable terminals including a slim-profile notebook computer and sub-notebook that exploit high-density mounting technology, and a computer that accepts digital pen input based on an original character-recognition technology. With this potent combination of mobile computers and mobile communications infrastructure, Hitachi is committed to identifying new business application areas which will harness the power of mobile computing. We anticipate that the mobile market will continue to expand as companies bring out a wide assortment of high-quality portable machines that are smaller, lighter, and provide longer battery lives than anything that is available today. And considering the dramatic increases in mobile communications throughput coupled with the sharp drop in tariff rates, we envision a major transformation of the information environment as a PC-based society emerges that includes individual consumers as well as businesses.

INTRODUCTION

MOBILE computing seeks to improve the efficiency of data management by harnessing the power of computers and enterprise networks to permit employees to manage customer data, scheduling, and

other information even when they are away from the office. Indeed, it is now possible to implement a mobile computing environment that closely parallels the desktop computer environment back at the office. Particularly as the speed and capacity of the mobile



Fig. 1—Hitachi Lineup of Mobile Computers.

Exploiting the latest advances in high-density packaging technology, the (a) VisionBook Pro, (b) VisionBook Traveler, and (c) FLORAPEN models are all well adapted for portable use.

communications infrastructure have improved, going on line to send e-mail, retrieve data over the Internet, and transmit data has become much smoother than in the past. Significant progress is also being made in developing multimedia mobile communications: videoconferencing, video telephony, and other image-based capabilities can be provided by installing a CCD camera.

This article will survey how mobile computers are currently being used in a number of different business environments, then describe Hitachi's mobile computer lineup highlighting those features that are tailored to the needs of the business community. Finally, we will describe a number of actual cases showing how companies have integrated mobile computing into their operations.

MOBILE COMPUTING ENVIRONMENT

The concept of mobile computing gained currency in Japan long before the hardware, communications infrastructure, and software reached practical maturity, so mobile computing at first was confined to a small group of computer experts and was not widely disseminated. Signs of greater market penetration of mobile computing began to appear with the rapid transformation of the environment beginning around 1997. According to Nikkei Market Access, 1.47 million portable data terminals were shipped domestically in Japan in 1997, and the number is projected to top 2 million units in 1998. It is thus evident that full-scale market penetration has now begun.

Hardware Environment

Earlier mobile computers were scaled down so that they could be carried around, but they were plagued by a host of other deficiencies: they were heavy, hard to use, costly, too small screen, and delivered poor performance. Not surprisingly, these early mobile computers were not well received by consumers. But around 1996 saw the advent of a new generation of mobile PCs integrating slim-profile notebooks and mini-notebooks that optimize usability and mobility with Japan's Personal Handyphone System (PHS) that adequately supports mobile computing for the first time. This happy convergence has fueled a fierce rivalry in the industry to produce portables that are thinner, lighter, and that offer vastly better performance than their predecessors.

Communication Infrastructure Environment

Mobile data communications was previously only

supported via portable phones at a slow throughput of 9.6 kb/s, and image-based applications such as multimedia mail and data retrieval over the Internet were haphazard at best.

This all changed in 1997 with the adoption of the PHS Internet Access Forum Standard (PIAFS) as the communication protocol of Japan's PHS, thus permitting a four-fold increase in mobile computing speed to 32 kb/s. The same high-speed throughput capability will be extended to portable telephony in 1999. Efforts are also underway to dramatically reduce the rates for portable telephony and upgrade mail services, that will be offered at a flat rate of approximately ¥10 per mail message.

Status of Software Development

Earlier products were implemented based on communications software, and numerous problems arose due to high communications rates, the prevailing unstable wireless connection environment, and other problems that were not taken into account. But as mobile computing became more widespread, better communications software including groupware and e-mail applications were developed that were specifically optimized for mobile communications. Meanwhile, there was an increasing need for transaction processing capabilities that would enable users to lookup and update data from remote locations away from the office. This led to the advent of software products endowed with agent capabilities that could mediate between clients and servers (functionality for making the most efficient use of a limited communications infrastructure), thus making it possible to provision an environment that was little different from that of the office.

FIELDS AND APPLICATIONS FOR MOBILE COMPUTING

As genuine support for mobile capabilities in the personal computer realm became available as described above, it was revealed in a recent survey conducted by the Japan Management Association that approximately 70 percent of companies were either already using mobile computers or were contemplating using them in the future. Table 1 shows the primary business and application areas that Hitachi has targeted as ripe for mobile computing capabilities, and we are developing products that are specifically tailored to these business needs. Let us now consider how mobile computing might be used in these various areas.

(1) Damage and life insurance

TABLE 1. Applications and features for conducting business
Application can be broadly divided into seven categories.

Application	Typical use	Advantages
Product introduction	Catalog function can be loaded in a portable terminal supporting presentations, but mobility is sacrificed at this point.	Frees user from lugging bulky brochure and heavy catalogs. Easily deals with frequent product model changes.
Planning and design	Simulate images of products during negotiations or while listening to needs of customer.	Easily set conditions or make changes on the spot to accommodate client wishes.
Estimates, settlements, agreements	Speed up decision-making of corporate businesses; essential function for business person in any industry.	Streamlines negotiation by obtaining determinations from supervisors or other related departments in real time.
Client management	Obtain data on clients by grouping based on past performance before setting out or while in transit.	Gather necessary information geared to business activity in a short time from client information database, thereby focusing business activities.
Check-off tasks	Improve efficiency of check-off tasks, and prevent mistakes.	Data can be readily processed by a PC instead of walking around with a bulky checklist.
Attendance management, business reports	Use e-mail to submit business reports to improve business person action management, rely on temporary expense advances to improve expense management, and use calculation processing to enhance accuracy.	Business reports can be submitted while on location without coming back to the office, thus permitting smooth progress to the next sales task.
Other	Business persons prepare contract agreements on the spot while negotiations are conducted.	Sales contracts can be readily amended or added to if necessary while at the client's location.

In the insurance industry, there is a definite need for the capability to access a host computer from anywhere a potential client's office, an insurance agency, the home of insurance sales personnel, and so on to quickly obtain information needed to support insurance business activities: calculating insurance premiums, estimating damages, and so on.

This kind of input work was often handled by PDA (Personal Digital Assistants) and other handheld devices, but now many companies are switching over to sub-notebooks and computers that accept pen input, and new product offerings are being introduced all the time.

(2) Maintenance tasks

Mobile computing is used to enhance work efficiency for such maintenance tasks as performing periodic inspections of equipment and dispatching personnel to perform maintenance work by enabling users to access technical support data such as customer data or work procedures from the home computer. There will be a growing demand for this type of PC application (including digital pen based computer) oriented toward tasks performed while the user is out in the field and walking around.

(3) Distribution industry

Mobile tools used as point-of-sale (POS) systems have already been introduced, and are used for a wide range of tasks such as ordering, sales, external sales, inventory management, and the like. In the future there

will be a need to add images and provide more concrete graphical types of information.

(4) Construction industry

Information technology is already rapidly penetrating various types of fieldwork in applications to safety management, structural inspections, final finish work inspections, and a wide range of other operations data management systems. There are numerous potential applications for mobile computers involving construction and facilities support systems and systems permitting the user to make estimates by viewing an image on the computer together with the client. In addition to these few industry niches that we have highlighted, many other types of businesses are looking to mobile computing to streamline their operations including medical equipment and supplies, auto and truck dealerships, travel agents, ceremonial facilities, and housing and commercial real estate agents just to name a few.

HITACHI'S LINEUP OF MOBILE COMPUTERS

Based on these types of situations in a business environment, we have developed a product line that fully exploits the advantages of mobile computing by targeting users who make frequent presentations and/or simulations such as to introduce new products, and users who value maximum portability and the ability to collect and transmit data from the field (refer to



Fig. 2—*Slim-Profile VisionBook Pro.*
Featuring built-in FDD, CD-ROM, and batteries, this notebook provides a powerful PC environment approaching that of a desktop.

Table 1).

All-in-One Notebook VisionBook Pro

VisionBook Pro design objectives

Conventional portable computers have never been very effective for delivering presentations because they (1) are too small, (2) are awkward to operate, (3) deliver insufficient performance, and (4) have small screens. This has meant that if performance, functionality, and usability are essential, a full-scale notebook is required that is too bulky and heavy for portable use. Our primary objective in developing the VisionBook Pro therefore was to overcome this dilemma with a product that provides the power and performance of a standard notebook yet is compact and lightweight enough for full mobility.

VisionBook Pro features

- (1) Regular full-featured notebooks with compact disc read-only memory (CD-ROM), floppy-disk drive (FDD), and built-in battery packs are more than 55 millimeters thick. This is too bulky to fit easily into a briefcase, and is therefore usually left behind. By contrast, the VisionBook Pro is only 46.9 mm thick with a 210-by-297-mm footprint, and can thus be readily slipped into a briefcase for easy portability.
- (2) The VisionBook Pro features a 14.1-in TFT large-screen liquid-crystal display. This approaches the screen size of a 17-in CRT display, and thus makes for powerful, persuasive presentations.
- (3) The notebook features built-in FDD, CD-ROM, and batteries to provide an all-in-one notebook solution that can be taken and used anywhere but with

- functionality comparable to a desktop environment.
- (4) The VisionBook Pro runs up to five hours without recharging on two standard nickel-metal hydride (NiMH) batteries. This means the notebook can be easily taken along without a second thought, since the AC adapter can be left at home or the office.
- (5) LAN connectivity is a standard feature. Since data can be sent ahead to the office over a high-speed network link, this greatly simplifies the task of updating sales results and other data when sales personnel come into the office from the field.

Sub-Notebook VisionBook Traveler

VisionBook Traveler applications

The VisionBook Traveler is a compact sub-notebook PC that can be easily taken into the field. It is designed for the busy mobile executive with capabilities to collect and send data, draft daily business reports, and make simple text-based presentations at a client's office or any location.

VisionBook Traveler features

- (1) Measuring 148 by 210 mm and weighing only 1.29 kg, the VisionBook Traveler is a compact, lightweight sub-notebook that is ideal for the serious mobile pro concerned about operability.
- (2) Featuring built-in LAN connectivity (a model with LAN connectivity is available) as well as two PC Card slots, this sub-notebook can flexibly accommodate a diverse range of mobile systems.

For example, a powerful business-support system could be created by combining a PHS communication card and a CD-ROM interface card. Then one could download information about a client over a LAN while still at the office, and use this information to make



Fig. 3—*Sub-Notebook VisionBook Traveler.*
With a compact 148 × 210 mm body and featuring two PC Card slots, this notebook can be flexibly configured to accommodate a wide range of different systems.

TABLE 2. Specifications for VisionBook Pro, VisionBook Traveler, and FLORAPEN
Specifications for each type of mobile computer.

Feature	VisionBook Pro	VisionBook Traveler*2	FLORAPEN (customized)
CPU	Pentium*1 II (300 MHz)	MMX Pentium 266/263 MHz	GX86-120 (120MHz)
Memory	64 Mbyte (maximum 256 Mbyte)	64 Mbyte (maximum 160 Mbyte)	16 Mbyte (maximum 32 Mbyte)
HDD	6.4 Gbyte	4.3/3.2 Gbyte	1.4 Gbyte
LCD	14.1-in (XGA)	10.4-in TFT	10.4-in TFT (SVGA)
Battery life	Approx. 4.0 h (using 2 batteries together)	3-5 h (using high-capacity battery)	2.0 - 5.0 h
PC cards	2 slots (Type II)	2 slots (Type II)	2 slots (Type II)
Size	312 mm × 262 mm × 46.9 mm (W × D × H)	257 mm × 214 mm × 29 mm (W × D × H)	276 mm × 198 mm × 35 mm (W × D × H)
Weight	Approx. 3.8 kg (with batteries)	1.29 kg	1.3 kg

CPU: central processing unit HDD: hard disk drive XGA: extended graphics array SVGA: super video graphics array

*1 Pentium is a registered trade mark of U.S. Intel Corp.

*2 Previous Japanese version model

dynamic electronic catalog-based presentations at client sites using a CD-ROM. And if a deal is reached, the contract can be drawn up and formalized right there on the spot over a PHS-based link to the home office. (3) With a 10.4-in TFT liquid-crystal display and ample keyboard with a 17-mm pitch, the VisionBook Traveler provides a far more readable and easier to operate PC environment than the handheld class of devices. This, for example, would permit an insurance sales representative to show simulated premium projections and other effective visual data.

The VisionBook Traveler is shown in Fig. 3, and the key specifications are summarized in Table 2.

FLORAPEN, a Pen based PC

FLORAPEN Applications

The FLORAPEN*1 is a pen input-based personal computer, that emphasizes transparent usability and visual clarity such as might appeal to people who are not used to using regular keyboard-entry computers. It would find many useful applications in the construction and architecture fields for sketching building or interior layouts, and in the distribution field for inventory management in the warehouse.

FLORAPEN Features

(1) The FLORAPEN's large 10.4-in active-matrix liquid-crystal display is easy on the eyes, thus making it especially effective for on-site presentations and promotions at a client's office. This mini-notebook will prove to be a convenient and effective business support

tool for conducting negotiations in the insurance, construction, real estate, and other fields.

(2) Supporting input by pen or touch, the FLORAPEN provides an excellent operating environment for people who are used to conventional PDAs (personal digital assistants) or people who do not like or know how to type using a regular keyboard.

(3) The notebook comes with two (Type II) PC Card slots to flexibly implement a range of system configurations tailored to different industry or business applications. For example, convenience stores and other retail outlets could use the FLORAPEN to configure a product ordering support system by filling



Fig. 4—Pen-Input Computer FLORAPEN.

With an easy-to-use pen-input interface, FLORAPEN can be used even while walking around.

*1 FLORAPEN is not available in the U.S.

the slots with a bar-code reader and a fax modem card. Ordering information could be generated from the store's daily product distribution codes by reading the bar codes, then the order could be submitted in a timely fashion by plugging into a phone line. The FLORAPEN is shown in Fig. 4, and the notebook's specifications are listed in Table 2.

ACTUAL IMPLEMENTATIONS

Now let us consider three actual cases where Hitachi's mobile computers have been put to effective use by different kinds of businesses in Japan. By studying these actual implementations, Hitachi gains valuable insights and expertise that will be reflected in future upgrades and products.

Business Support System

Sapporo Breweries, Ltd. implemented a business support system called Starnet based on the VisionBook Traveler (Previous Japanese version model). By giving their sales personnel access to specific examples of how to deal with certain situations over the network, this is expected to help with negotiations and realize a speedier response. Employing mail, intranet, and VB applications, the system enables sales personnel to gain access to and share company information when they are out in the field just the same as if they were back at the home office. Although the company had an internal mail system before, employees now have the capability to send mail outside the company as well. The intranet is used to deliver all sort of information that previously was distributed by fax or plain-old paper copies. Aside from sales performance data, some of these types of information include industry updates and summaries, in-house sales incentives, POPs, success stories, legal questions and answers pertaining to business issues, in-house questionnaires, and so on. In addition, VB and CommuniNetExtensions are used to reduce desk work by enabling sales personnel to input their business expenses from outside the office. Connectivity was available within the company over local-area and wide-area networks before, but with the implementation of Starnet, connectivity was implemented via the Internet using mobile phones in conjunction with PDCA (Personal Digital Cellular Adapter) cards supporting throughputs of 9.6 kb/s. Starnet was deployed at several work sites on a trial basis in October 1997, and was extended nationwide in April 1998 for full-scale implementation.

Business and System Engineering Support System

Business person and systems engineers who went on business trips for Hitachi Cable always used to draft their business reports and calculate their travel expenses after returning to the office, an arrangement that made for poor business efficiency. To improve this situation, employees going on business trips were equipped with VisionBook Traveler (previous Japanese version model) featuring a portable phone, a PDCA card with a throughput of 9.6 kbit/s, and a fax modem card supporting a speed of 33.6 kbit/s. This not only gave them a way to receive e-mail on trips and at home, they could also use VisionBook Traveler to send in their reports and calculate their expenses. This enabled Hitachi Cable to increase the productive time business person spent with clients by 80%, and the company started equipping its outside business person and engineers with the notebook in one division at a time beginning in the first half of 1997. And by utilizing software that includes a scheduling function (Sukesan 95) via e-mail, the company put in place a work environment that is independent of location whether the employee is at the office, off on a business trip, or at home by supporting scheduling management and the sharing of data for employees on business trips.

Maintenance Personnel Support System

Hitachi Electronics Services already improved work efficiency and achieved a near paperless work environment by issuing Handy Terminal type personal digital assistants to all the company's Customer Engineers. But to promote faster services, a higher level of service activities, and increased customer satisfaction, the company gave NL1 [an earlier version of VisionBook Traveler (previous Japanese version model)] that was equipped with a hybrid communications card to the Customer Engineers. The hybrid card features a modem for communication in the field, and a LAN hookup for communication at the office. Of course mobile computing includes the functionality of a traditional on-line terminal, but it also embraces groupware, Internet, intranets, and the newly developed fieldwork support system capabilities. By dramatically improving the efficiency of a full array of tasks, Customer Engineer scheduling, information sharing, work prompting, and reporting both out in the field and back at the office, the efficiency of service activities have been markedly enhanced by enabling Customer Engineers to get on the next customer much more quickly.

TABLE 3. Capabilities required by the SFA
Sales Force Assistants should provide a full array of support capabilities enabling business person to do their job logically and methodically.

Function	Description
Schedule management	• Ability to support efficient use of time.
Action support function	• Indicates the next appropriate action to take when changes in business proceedings occur. • Provides customer information management and an action list. • Provides a reference function showing necessary functions. • Support for drafting business letters.
Contact function	• Records essentials of sales activities.
Communication function	• Timely support for receiving and sending information.

FUTURE DEVELOPMENTS

In pursuit of corporate competitiveness and efficiency, reform of business practices is most often cited as the critical issue, for it is through a company's sales activities that consumers know the corporation. Mobile computing is increasingly being used to support Sales Force Assistance (SFA) capabilities that provide a sales person with a full range of secretarial functions when he or she is in the field.

Currently a client-server system at the office is used to work up marketing data on a prospective client which is then taken along as material by the sales person when he calls on the customer. But along with the emergence of Sales Force Assistants, this kind of data has also become portable, and a dynamic interactive presentation delivered right there on the spot during a sales negotiation has enormous persuasive power and compelling sales force. And this in turn helps differentiate your company from other rivals and enhances your company's competitiveness. The primary issues are the human interface with the customer and the compelling power of a good presentation.

Here I will highlight five points that will be central considerations driving the evolution of next-generation mobile computer products:

(1) Multimedia processing capabilities will be strengthened to achieve presentations that have a high persuasive sales effect.

(2) Digital pens and other novel input devices are being studied as ways of implementing transparent, easy-to-use human interfaces.

(3) Operability and portability (in both qualitative and quantitative terms) will be pursued further, and toward this end, hardware that is more portable and easier to use is being investigated.

(4) Communications capabilities will be reinforced to make mobile communications easier.

(5) Software will be developed that provides the full panoply of functions required by Sales Force Assistants (refer to Table 3), and ways of supporting that software will also be explored.

CONCLUSIONS

This article has examined some recent trends in mobile computing, and described Hitachi's lineup of mobile PCs. Hitachi will continue its development efforts to design lighter weight computers to enhance portability, longer-lived batteries, larger and better resolution screens for improved usability, implementation of a full-scale keyboard, and more robust communication functions supporting mobile communications. In addition, we are also committed to strengthen ties with HPC corresponding with Windows CE*², and to develop new mobile systems that are optimized for individual consumers as well as for business applications.

REFERENCE

(1) Nikkei Market Access, April 1998, <http://www.Nikkeibp.co.jp/MA/>

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*² Windows is a registered trademark in the U.S. and other countries of Microsoft Corporation.