

VAIO LX Series Developers' Stories

After four years in development, the ultimate family PC becomes a reality.

Last year we featured a series of articles on the development of the VAIO L series, which aimed at being the ultimate family PC. The L series introduced many family-friendly features such as Simple Connection for linking a computer and monitor with a single cable, Double-hinge Connection for easy adjustment of the display angle, and the Programmable Power Keys, which allow the user to launch a web browser or e-mail application at the touch of a single button. In October, the L series was succeeded by the new VAIO LX series. The developers tell the story behind this amazing new series.

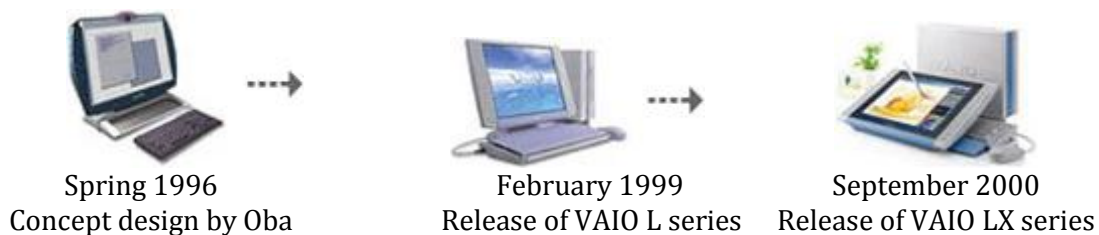
A Four-Year Dream finally Realized in the VAIO LX

Haruo Oba (designer)

Haruo Oba of the Creative Center designed what became the VAIO L and LX series in 1996, before the first VAIO computer was even released. The feature Oba wanted to emphasize most in his design was not included in the original L series, but has finally become a reality with the VAIO LX.



“My proposal was for a PC with a new user interface: a pen tablet instead of a mouse,” Oba says. “This interface is easier to use for people who aren’t used to a keyboard, and of course more practical for professional designers than a mouse. Four years ago, this idea was impractical for a commercial PC, simply because the cost of LCD panels and large tablets was so high.” Like the L series, the VAIO LX features the ergonomically designed Double-hinge connection, which allows the monitor to be set at the same angle as one would use for reading a book. Also, the keyboard can be put away under the monitor to save space. However, the ability of the user to interface with the computer by drawing directly on the screen is truly the LX series’ distinguishing characteristic. When the LCD Pen Tablet became practical, the LX Series was born, and Haruo Oba’s four year dream became a reality.



Oba conceived the idea of the Pen Tablet interface because “I just didn’t think the mouse- and keyboard interface was terribly successful.”

“First off, consider the keyboard. The QWERTY key layout*, which is standard for PCs, is generally thought of as easy to use because the keys most often used are centrally located. On the contrary, this layout was designed to be inefficient and slow due to the inability for the original manual typewriters to keep pace with a fast typist. In fact, using a more efficient layout tended to jam the keys and even break the keyboard during heavy use. This just didn’t make sense to me.” Oba predicts the day is not far off when a mouse-less and keyboard-less computer will be the standard in the PC market. The VAIO LX is the first step toward that day.

Of course, for the VAIO L and LX to be practical for the current market, Oba designed them with a keyboard. The L and LX feature a unique palm rest that folds over to become a keyboard cover. Users would not always close the protective cover before putting the keyboard under the display, so Oba designed it thin and compact enough so that the display would not touch the keys at any angle the user set it. Thus function determined the form of the VAIO L series, starting from the basic design of the keyboard.

* Keyboard layout named after the first 6 keys in the top row: QWERTY.

The new VAIO LX series features new devices designed for the new Pen Tablet interface. The keyboard and the base of the display are designed to integrate with one another, and the keyboard can still be accessed even when placed under the display. Oba recognized that many professional designers, while using the pen in their right hands to draw on the display, would still want to use the shortcut keys** with their left hands when using serious design applications like Adobe Photoshop and Illustrator. Thus the keyboard can be slid to the left to access the shortcut keys, or slid to the right to access the numeric keypad and Programmable Power Keys.

Oba admits that the VAIO LX does not represent the perfection of the PC-Pen interface concept. "Sure, there are a few pen-equipped PCs," he says, "but they're mostly limited to business-use, with small displays and no keyboards, and were designed especially for the pen interface. We can't proceed too quickly, eliminating one interface entirely and replacing it with another, or else the market will never be able to keep up. I conceived the VAIO LX as a bridge between the conventional interface and the next one, giving users the option of using the keyboard and mouse if desired." And when the pen or sound input interface becomes standard, without question, Haruo Oba will have a new 'ultimate' design ready.



VAIO LX series keyboard numeric keypad becomes smaller, while retaining easy operation of full keyboard.

The developers of the VAIO L Series redefine Ease of Use

Masato Kunimori (product planner)

"When the VAIO L series was first released, there were plenty of micro-tower and component-type PCs on the market. In this market, people just thought the VAIO L was an ordinary space-saving PC," says Masato Kunimori, in charge of product planning. "We created the VAIO L to be the ultimate family PC, introducing such features as simple connection and programmable power keys, which make the computer easy to use. We also incorporated many features that do make the VAIO L quite compact, but 'saving space' in itself was never a major development goal. It's a bit ironic that VAIO PCs had a lot to do with establishing this market, but the VAIO L, which exemplifies the concept, actually made it to market later than the others.



The planning concept of the VAIO LX series was 'the new direction of the family PC.' The LX is the successor to the L, but operation is made even easier by the incorporation of new Pen Tablet user interface. We can see that several features from the L series have been improved and refined, for example the double-hinged display stand. This mechanism, which allows the user to adjust the height and angle of the display, has been improved for the LX series, allowing the display angle to be set from vertical (90°) to nearly horizontal (25°). This feature allows users to view the screen horizontally when using the Pen Tablet together with a design application, and vertically when using a word processor or Internet application. In addition, the display can be pulled down to the desk surface, reducing the distance between the monitor and keyboard. We call this 'Smart Typing Style', and it should make typing easier for beginners, who won't have to move their eyes far from the application window and the keys.

The VAIO LX accommodates to a number of user styles, allowing easy use and enjoyment by anyone.

Programmable power keys are grouped on the right side edge of keyboard, allowing one-touch launching even when the monitor is pulled down.

"Another change for this series is the Simple Connection wiring. On the VAIO L series, the keyboard and mouse cables were connected to the computer's main unit. On the new LX series, they are connected to the



** Combinations of Ctrl, Alt keys with alpha keys such as Ctrl+C and Alt+S for quickly inputting commands.

display. Control signals for the keyboard, mouse and tablet, along with video and audio[†] signals, all pass through a single 1.5m cable running from the main unit to the display. This means that the core of the system has become the display, and the main unit can be set up out of the way, wherever the user wishes.



All signals pass through a single cable between display and main unit, allowing the user total freedom in setting up the VAIO LX.

“We also added a ten-key numeric keypad as a result of user feedback from the L series. However, the trick was to add the keypad without increasing the overall width of the unit. We accomplished this by reducing the space between the main keys and the keypad, reducing depth by shortening the function keys (F1-F12) and moving the programmable power keys to the right side. Consequently, the depth of the LX keyboard is actually 36mm shorter than that of the L series. Due to the need to set the display to a more

acute angle, we also had to make the display thinner than the L series display.”

The LX series is much more expandable than its predecessor. The two USB terminals in the L series have been increased to five in the LX (1 front, 3 rear, 1 on the display). Network compatibility was added for the first time with a 100BASE-TX/100BASE-T connector for users who want to set up a high-speed Ethernet LAN at home. What’s more, with a built-in Memory Stick slot and two i.LINK terminals, there will be little need for users to put anything in the VAIO LX series’ spare PC card slot - but it’s there anyway, just in case.

The L series’ trademark metallic-looking main body, with its recessed front panel, has been retained in the LX series, with a few minor changes. The covers of the PC card slot, USB terminals, i.LINK terminals and Memory Stick slot now slide open towards the front of the main panel, so that the open covers will not interfere with peripherals such as wireless LAN cards. Also, the violet line in the center is thicker, giving the LX a bolder, more powerful appearance.

The CD-RW drive has been placed in the center of the main unit in the LX, as opposed to the L series where a floppy drive had this position. Interestingly though, the designers had a hard time incorporating this drive into the center of the unit and still have a compact design, because a desktop CD-RW drive has about 3 times the volume and greater depth than the thin notebook drive used for the L series. However, the performance of the desktop drive is much higher: the LX series CD-RW has a write speed of 8x, and a read speed of 32x, whereas the L series drive was only 4x and 20x.



The main unit has been completely redesigned, while retaining the popular thin metallic form. The right side cover slides open, allowing smart use with cards and cables.

The hard work paid off with the launch of the LCD Pen Tablet

Masahiro Takihara (project leader)

“There are a great many types of tablets,” says Masahiro Takihara, leader of the Electronic Mechanism Planning project, who along with Masato Kuninori selected the LCD tablet for the LX series. “You’ve got the simple pressure sensitive types, then optical, ultrasonic and capacitance types, and then the electromagnetic induction type. For the CLIÉ handheld PDA, we used a pressure sensitive touch-screen. We were really on unfamiliar territory when planning the VAIO LX, because it was the first time for anyone to incorporate a full-sized tablet into a desktop PC display. Finally, after comparing the different types produced by various manufacturers, we decided to go with the electromagnetic induction type produced by WACOM Technology, Co.”



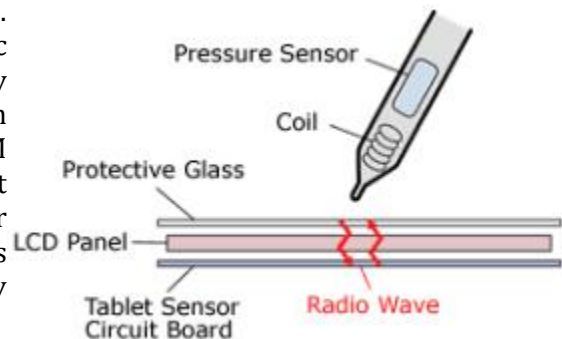
“The electromagnetic induction type is superior to the others in many respects. As it applies to the LX series, the main advantage was that it reacts only to a special stylus or pen, and not to other objects such as the user’s fingers”, recalls Takihara. “The first thing we had to decide was whether we were going to make users draw on the tablet with their fingers, a pen, or both. With the CLIÉ’s tiny display, this is not an issue. Drawing on a 15-inch screen, we found it impossible to keep a stable posture unless we put our hand on the display. This immediately ruled out the pressure-sensitive tablets, which would sense both the pen and the

[†] The displays of both VAIO L series and LX are equipped with stereo speakers.

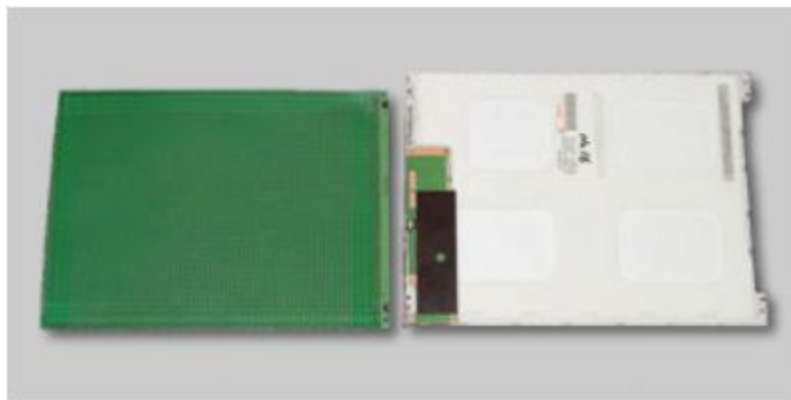
user's hand, and become confused. However, we did keep this option open by only sensing the upper-left point in the case of a conflict, but found that would cause problems for left-handed users. Finally, we decided to limit input to one method: the pen."

"The deciding factor in choosing the electromagnetic induction type over the other pen types was the fact that it allowed users to operate the pen as easily as a mouse. With an electromagnetic induction tablet, the user doesn't have to directly touch the screen with the pen tip for the cursor to move. Other types won't move the cursor from its starting point unless the pen tip is actually touching the screen, and executing a command. You can imagine the potential for mistakes, for example pushing a window's Close button when you meant to push the Minimize button. All of our developers agreed that Magnetic induction was the best way to go."

Takahara explains why he chose WACOM Engineering, Inc. over the other manufacturers that produce electromagnetic induction tablets. "One reason is that WACOM had already started developing a 15-inch EMI tablet, which showed high probability of success. The other reason was that the WACOM pen was cordless, and didn't require batteries. We did look at the EMI tablet suggested by another manufacturer, but their pen had a built-in battery and was very heavy. WACOM's tablet was the only one that let users write and draw as easily as with a normal pen and paper.



A few details remained to be ironed out, however, before commercial production of the tablet could begin. Because of the complexity of its mechanism, the electromagnetic induction tablet took a long time to produce. For it to work properly, it was necessary for the sensor, which reads electromagnetic impulses from the pen, to be located under the LCD panel. This was a problem, because standard LCDs contain a control panel that doesn't allow electromagnetic waves to pass. Undaunted, Takihara ordered a special 'custom-made' LCD panel, with the sensor placed between the LCD and its control panel, from Hitachi, a leading manufacturer of liquid crystal displays. Hitachi's solution, after having understood the situation, was to separate the display panel from the control panel of a standard 15-inch display, and insert a set of flanges similar to the plastic projections used to hold the lyric sheet inside a CD case. Hitachi then produced a special sensor panel, to be inserted in the space between LCD and control panel. This problem, at least, had been solved.



Sensor (left) and back of LCD panel (right)

The black portion at lower left of LCD panel is the LCD control panel. Because the control panel would not permit electromagnetic signals to pass, it was necessary to insert the sensor between the LCD (white) and control panel.

However, there was a bigger problem for the developers to confront: the viewing angle of the LCD. "An LCD display is designed to be viewed from the front, or from above," Takihara says. "When placed at an acute angle and viewed from below, an LCD inverses its colors like a film negative. This was a problem,

because we intended users to use this tablet while leaning back and relaxing in a chair, with the tablet at about 25° from horizontal. However, if we designed the LCD to be most comfortable used in this position, the picture would be ruined when the display was put into an upright position. We experimented with several possible solutions, including one design that allowed users to reverse the polarity of the LCD by flipping a switch, which we decided was too inconvenient to be practical.” Takihara smiles at the recollection. “We even played with the idea of incorporating a ‘body sensor’ that would automatically switch the LCD polarity when it sensed human eyes viewing the screen from below.”

“Finally, we realized there was only one solution. We had to use Hitachi again. Their Super IPS LCD has an unusually wide viewing angle -- nearly 170 degrees -- while retaining excellent color reproduction. The only tradeoff was that this LCD, designed for desktop PC displays, is very thick. It was, in fact, too thick. The Pen Tablet has a sensor under the LCD panel, and if the LCD is too thick for the sensor to read the electromagnetic signals, the tablet won’t work properly. We discussed it with the Hitachi engineers and implored them to produce their Super IPS with a thinner LCD.” Takihara grins. “They said they’d come up with a solution one way or another. Hitachi’s eagerness really saved our backsides. Sure, they probably had their own reasons for taking on the project so willingly. It was a great opportunity to show off the power of their Super IPS. Still, if they hadn’t backed us, the Pen Tablet would’ve made it to market much later than it did.”

Creating the Ultimate Interface

Hideyuki Agata (Software Developer)

“The software for a PC equipped with a Pen interface has to be developed with the Pen in mind. Only in this way will the inherent advantages of the Pen interface be fully utilized,” claims Hideyuki Agata, the software developer for VAIO. “Graphic software and system software, such as Windows Me and Windows 2000, were both developed for use with the mouse as the interface. That’s why they rely on actions like clicking and double-clicking. The Pen, on the other hand, provides intuitive operation simply by tapping the screen directly.”



“We didn’t want customers to ask, ‘The Tablet is fun to use, but isn’t it just a different kind of mouse?’” adds Agata. Clearly, Agata’s intention was not merely to build a better mouse. In fact, he envisions the LCD Pen Tablet as the interface of the 21st century, completely eclipsing the keyboard, which essentially has not changed since the days of the manual typewriter. Yet, to convince users of the superiority of the Pen interface, Agata foresaw the need for software designed specifically for use with a Pen interface. Under Agata’s direction, his team developed three Sony original software applications to put the pen in motion, so to speak.

The first of these software applications is a media browser called VisualFlow. VisualFlow had already been released in the summer of 2000 in the VAIO L series models, which were originally intended to feature the LCD Pen Tablet interface. In the end, the interface was not used, and VisualFlow was introduced as a viewer application for displaying still and moving images, and sound files saved on a Memory Stick. Then with the release of the LCD Pen Tablet equipped VAIO LX, an upgraded VisualFlow version 2.0 enabled easy-to-view multi-layer displaying of files and folders, as well as smooth interaction with PictureToy. The true potential of the application started taking shape, and the Pen had in fact become mightier than the mouse.

Of all the characteristics that define VisualFlow, it is the smoothness and speed with which it allows users to move objects on the screen that really makes it exceptional. With VisualFlow, image files are displayed in a spiraling 3D-like structure, ideal for viewing thumbnails. This way, image and even sound files can be handled smoothly, as if they were floating in water. Rearrange files to view by name or size and in an instant the images reorganize like a school of fish dispersing at once. In fact, the LCD Pen Tablet is so responsive to the user’s actions the menu can be activated simply by bringing the pen near the screen.



This screen shows the way the media browser VisualFlow displays images in a spiral. Positioning images this way makes their sizes appear differently. Simply touch the screen with the Pen and the images begin to flow. It is impossible to fully explain the unique way that VisualFlow displays images on the screen using mere words and still images. Download a trial version and see why it won the Good Design award in Japan.

“While with a mouse it takes a long time to select images, a pen-type interface lets users work on the screen directly, giving the sense that the pen and the screen are one,” Agata adds with a smile. “Most importantly is fluid movement. If the screen can't follow the movement of the pen, the ease of use becomes an obstacle for the user. This is why, when we were designing the program, we had to enhance the screen's ability to follow the pen without delay.” In fact, admits Agata, “to be perfectly honest, the first time I saw a design image, I was irritated that I couldn't move the pen quickly.” But that was before a series of tune-ups for VisualFlow. One of the main advantages of VisualFlow is an exceptionally fast read-time. This allows users to fully experience its potential, even when using a keyboard and mouse to access a folder filled with image files, for example.



The second software that Agata developed is a paint application called PictureToy--an introductory-level software that lets users draw easily using a pressure-sensitive Pen with an eraser function.

“We envisioned a system where users can interface by tapping an object with a pen directly on the screen, without pull-down menus or double clicking. We also realized the importance of interoperability with other software,” recalls Agata. In fact, using VisualFlow (mentioned above), users can access still images to add stamps and a variety of effects, again and again, without affecting the original file. PictureToy also works with E-mail software, letting users attach original artwork at the touch of a button, and send simply by adding the recipient's address. This lets even beginners perform a variety of complicated operations, such as marking a route on a map, adding clever stamps and attaching the revised map to an E-mail message. Simply put, PictureToy makes using other software as easy as playing. In fact, there is even a mode that hides operation buttons so children can enjoy the full screen canvas without causing any problems to the software. Not a bad idea for adults to scribble away stress, either.

In addition to Agata's Pen-oriented software, the VAIO LX models feature a rich collection of applications -- Adobe Photoshop LE for advanced image processing, and Adobe GoLive and Adobe LiveMotion for producing original Web sites, and Adobe Premier LE for digital video editing. In short, the VAIO LX series models have it all, satisfying a full-range of users, from the most basic beginners to professional image creators.

Kuninori may have articulated it best when he expressed his feeling of accomplishment at having helped to create such a wonderful tool. Surely, his opinion holds for all of the VAIO LX series developers.

NOTE: This article was originally published by Sony Corp. on Sony's Japanese website (now removed). This version of it was painstakingly reconstructed using the Internet Wayback machine. Steven Lindell, 2009.