

Chapter 7 | 1986 - 1991

Three Challenges in Renovating the Business Structure Creating New Demand by Strengthening Product Appeal

Responding to the surging value of the yen following the Plaza Accord, Sharp began redefining the company's business structure under a new management team. The company created a three-pillar strategy: expanding the non-consumer electronics business, such as information/communications equipment and electronic devices; increasing the ratio of domestic sales with products that create new demand; and shifting production overseas.

Through determined efforts in these areas, Sharp transformed challenges into opportunities and put the company back on the growth track. Sharp also foresaw the potential of the LCD business and made efforts to develop LCD-based applications.

Electronic organizers and word processors became a huge success, and Sharp took a decisive leadership role in the age of information technology.

Blueprint for a refrigerator with a dual-swing door, which allows the door to open in either direction, an example of a demand-generating product

1 Chance Is Found in Changes

President Tsuji Appointed

President Saeki was convinced that Sharp was establishing a new structure that could effectively respond to changes in the business environment in the difficult climate following the Plaza Accord. On June 27, 1986, he said, "I would like to entrust management for the future to a younger generation with the faith that their creativity and agility can be effectively put to work." Saeki became the new chairman and appointed Haruo Tsuji, who had been a senior executive director, to be the new president. On June 26, 1987, Saeki retired from the position of chairman and became a corporate advisor.

President Tsuji had become a member of Sharp's board of directors in 1977 after serving as the Group Deputy General Manager of the Consumer Electronics Marketing Group and the Group General Manager of the Electronic Equipment Group. His achievements included the development of in-house production for VCRs—an area where Sharp had been falling behind competitors—and an increase in the market share for color TVs. From 1984, he had worked as the head of the consumer electronics business. He contributed to business expansion by being in charge of a wide range of operations, including production and domestic and international sales.

Upon his appointment as president, he expressed his hopeful vision. He stated that, "When drastic changes are

happening, as they are now, motivations for new technology, new products, new demand, and new culture are born. I'd like to take this positively, believing that there is a silver lining within these dark clouds." He set a company-wide slogan for the following year of 1987 as "Catch the opportunity in change and create new demand. Have a creative spirit for innovation and act upon it."



New management team with Chairman Saeki (right) and President Tsuji

Business Innovation to Overcome the Strong Yen

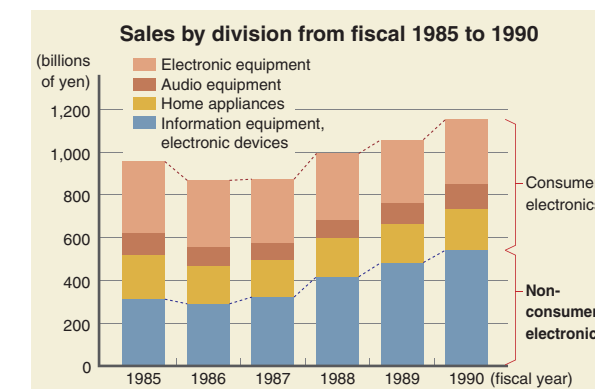
Starting a Strategy to Chase Two Hares at Once

In the currency exchange market, the yen quickly rose in value against the US dollar following the Plaza Accord. The value of the US dollar averaged 238.53 yen in 1985, but it decreased to 168.52 yen the following year. The effect of the stronger yen was serious for Sharp, where more than 60% of sales came from exports. Sales for fiscal 1986 fell to 90.9% of the previous year's level, and recurring profit was just 58.8% of the previous year's total. For the first time in 11 years, Sharp reported a decrease in its income and profit. It was an emergency situation.

Sharp took immediate measures to respond to these developments. First, the company elicited new ideas from all domestic and overseas divisions for emergency measures to create a system whereby the company could make a profit even if the dollar fell to 150 yen. From October 1986, company-wide efforts were initiated to revitalize the business. The plan consisted of 116 items (subsequently to be increased in quality and quantity) such as the early introduction of new products, the utilization of parts procured from overseas, and a review of expenses.

Meanwhile, Sharp began making comprehensive revisions of the business structure. The company took on a strategy of "chasing two hares at once," considering pressing issues for management while also looking at the mid to long-term future. The company created the following three-pillar strategy.

First was a shift to growth areas. While expanding the consumer electronics market, the company would also shift to technology-intensive and large-scale equipment businesses, and it would expand its business in the non-consumer electronics market with information equipment and electronic devices. The company would particularly focus on the area of optoelectronics and invest heavily in LCD technology that would become a central driving force for the company. As a result, the ratio of sales of non-consumer electronics increased from 32.6% in fiscal 1985 to 46.9% in fiscal 1990.



Second was the creation of brand new products and the strengthening of domestic business. The company utilized the Creative Lifestyle Focus Center (established in 1985) and worked to create high-value-added products that would create new demand, working from customers' perspectives and applying key devices. As a result,

domestic sales increased, and the company's percentage of domestic sales grew from less than 40% in fiscal 1985 to 52.3% in fiscal 1988.

Third was to establish a global production system that would not be affected by fluctuations in foreign exchange rates. Sharp aimed to increase the ratio of overseas production in overseas sales and opened and expanded production facilities in both advanced countries and developing countries to benefit from their geographical advantages. As a result, the value of overseas production in fiscal 1988 was nearly double what it was in fiscal 1985.

These efforts resulted in a recovery of sales. Sales in fiscal 1987 were up slightly (100.5%) compared to the previous year. Sales in fiscal 1988—when the yen was at its strongest for that period—were up (113.7%) compared to the previous year. Sharp was thus able to overcome the strong yen.



Sharp Appliances (Thailand) Ltd. (SATL), a manufacturing subsidiary, was established in Thailand in 1987

Implementing a Company-Wide, Comprehensive Strategy: Jump Up 80

In 1988, a comprehensive company-wide strategy—Jump Up 80—was implemented as Sharp prepared to celebrate its 80th anniversary in 1992. Considering that increasing organizational efficiency alone wouldn't raise the morale of the company, Sharp came up with bold measures for the future. The strategy called for using optoelectronics as a core technology to expand the size of the business; it also called for placing more emphasis on information and electronic devices as well as other new areas. With an eye toward the 21st century, Sharp planned to build a foundation for management that would maintain double-digit annual growth even after the company achieved the one trillion yen annual sales milestone.

In the late 1980s, Japanese companies utilized the deregulation of financial markets and strengthened corporate financing. Sharp issued domestic convertible bonds and bonds with warrants in US dollars to raise finance of about 98.9 billion yen in 1987 and 173.9 billion yen in 1989. Helped by a bull market in shares, the company increased its ratio of self-capitalization to 49.8% at the end of fiscal 1991, up 11.2 points from fiscal 1986. Sharp also issued commercial paper (CP)* to raise capital for the short term and reduce finance costs.

* Commercial paper (CP): A discount style of promissory note that leading corporations issue in the open market for short-term financing. Promissory notes have now been entirely replaced by a paperless electronic CP (short-term bond).

2 Aiming to Strengthen Corporate Culture

Restructuring the Sales System Responding to the Popularity of Office Automation Products

Around this time, office automation (OA)* was spreading rapidly in Japan, and large-scale consumer electronics stores carried more and more of these products. To respond to this change, Sharp consolidated the separate marketing groups for consumer electronics and information equipment into one organization in 1986.

In January of the following year, the PA products* and copier divisions of Sharp Business (SBK) and Sharp Consumer Electronics were merged to become Sharp Electronics Sales Corporation (SEH). This was done partly to improve responsiveness in distribution. Meanwhile, in the OA products area, Sharp System Products (SSP) and Sharp Electronics Specialty Equipment Sales were integrated into the remaining divisions of SBK, and the combined business was restarted under the new corporate name of Sharp System Products Co., Ltd.



Videos were used to provide product information on a regular basis

The domestic marketing division focused on improving the dissemination of information to dealers. They supplemented the existing *Sharp News* periodical with audio-visual information tools that could be used to present product information in a vivid, lively manner.

In April 1987, the Information Communication Marketing Group was established to be in charge of dealing with governmental agencies, large corporations, and Nippon Telegraph and Telephone Corporation (NTT). In June 1988, in addition to the existing OEM orders from NTT branch offices, Sharp received an order from NTT's headquarters. Following that, the weight of sales for communication devices started growing rapidly within the Group.

Additionally, in public relations activities, Sharp increased its involvement as a sponsor in international soccer games and at the Asian Pacific Awards—an event honoring distinguished books in Asia and hosted by Mainichi Newspapers Co.

Measures to Bring Out the Talents of Employees

■ New Personnel Evaluation System, Valuing “People”

Seeing that people would be the key to dealing with the difficult business climate prevailing in the late 1980s, Sharp developed a new personnel system.

In 1988, the company implemented an internal application program where employees could tackle areas that the company was pursuing. The program was designed to advance the company's goal of placing appropriate talent on important and pressing work, while meeting the needs of employees wishing to take on a new and interesting challenge. In 2000, it became a permanent program under the name of the Open Recruitment System.

In 1987, Sharp started an overseas trainee program to train employees to be ready to perform on a global stage. Trainees were sent to Sharp's overseas subsidiaries, to language schools, and to major universities such as the Massachusetts Institute of Technology. In 1988, Sharp started a program to send employees for a limited time to organizations inside and outside the company, so that they could gain a wider range of knowledge and cultivate networks of people in various fields. When sent outside the Sharp Group, the employees were sent to research institutes, universities, companies in other industries, and companies overseas, to acquire knowledge and information that couldn't be acquired inside the company. In 1991, a career development rotation program was implemented. This provided young employees in the administrative and marketing fields with opportunities to experience different jobs and workplaces and to develop a wider perspective.

A new personnel evaluation system, based on the CM (Creative Management) program, was implemented in 1989. It was a unique personnel evaluation program where employees had an interview with their superiors to set goals and evaluate their performance. The evaluations not only served as criteria for determining raises and promotions, but they also helped to develop individual capabilities and increase motivation.



Sharp supported the self-improvement of employees through the Saturday Technology School (started in 1984) and the Saturday Business School (started in 1985)

■ Company-Wide Small-Group Activities Become CATS Activities

In 1989, Sharp started a facility-maintenance program, TPM (Total Productive Maintenance), to be participated in by all employees. In 1990, TPM and the small-group activities by quality-control circles were integrated into the Sharp CATS (Creative Action Teams) program. The name symbolized the creative and agile nature of the small-group activities. CATS identified issues in the workplace and held activities to address these issues and raise the quality of work.

Product Development by Listening to the Voices of New Consumer Leaders

■ Establishing the Creative Lifestyle Focus Center

In April 1985, the Creative Lifestyle Focus Center was established based on the idea of then-Senior Executive Director Tsuji. The center would gather the diverse voices of consumers to understand their purchasing patterns accurately in order to develop new types of products. Tsuji focused on the trend of individualism in consumer leaders' thinking and how it affected the preferences of people. He presented the idea of “personal appliances” as opposed to conventional “home appliances.”

The company began a program of studying about 500 highly lifestyle-conscious consumers to better understand user trends. The program was designed to analyze their lifestyles and product needs through group interviews and other means.

The Creative Lifestyle Focus Center was upgraded to the Creative Lifestyle Planning Group and the organization further enhanced in April 1991.



A meeting at the Creative Lifestyle Focus Center (1985)

■ Introducing the U's Series

As more women were participating in the workforce, the needs increased to make housekeeping more efficient and to make better use of time and space. Sharp discovered the needs for “new necessities” through lifestyle surveys and developed a product line called the U's series. One survey showed that, although many time-conscious working wives were already using toaster ovens regularly, they were not familiar with microwave ovens. From these results, the company got the idea for a combined toaster/microwave oven, the RE-102. It was well received, as it saved both space and cooking time.

The first products from the U's series introduced in September 1986 were the RE-102 and the SJ-30R7 “cooking” refrigerator that had a built-in microwave oven. Sharp also launched the “ist” series for the new mature generation who



The RE-102 was a microwave oven with a toaster oven function. It could defrost frozen food, warm it up, and bake it quickly. Its low height allowed for a compact size that could fit on a dining table.

sought quality and real value.

These were examples of Sharp's efforts to capture and analyze the characteristics of people's changing lifestyles and behavior, so that the company could develop unique products.

■ Introducing Unique, Industry-First Products

In January 1989, Sharp introduced the revolutionary SJ-38WB, a refrigerator with a dual-swing door that could open to the right or left—the first in the industry. The mechanism of the door for this product was born from an idea of an engineer who was inspired from seeing his wife's brooch. He applied the idea from the mechanism of



The SJ-38WB was a refrigerator with a dual-swing door that could open in either direction. When the door was being opened, the locking mechanism on the opening side turned to release, but the other side remained locked.

the turn stopper that keeps the pin of the brooch from releasing. Using this insight, he persevered until he achieved the new design.

In 1987, Sharp released the ES-X1 washer/dryer, which incorporated a washing machine and a dryer in one unit. And in 1991, the company introduced a fully automatic washing machine, the ES-B750, which used air bubbles to clean—a world-first. The air bubbles effectively dissolved the detergent, improving the washing power and reducing the unevenness of the washing.

In the area of color TVs, Sharp introduced high-value-added products with large screens and outstanding picture and sound quality to support authentic audio-visual experiences. Sales at large-scale consumer electronics stores, where Sharp was strong, increased. Sharp's share of domestic TV sales grew from 2.7% in 1981 to 15.5% in 1987, making it number two in the industry. (Source: *Japan's Television Industry: The Structure of Its Competitive Superiority*, by Atsushi Hiramoto)

In December 1990, Sharp introduced the VC-BS50, a VCR that had a vacuum deposition head and enabled users to enjoy high-quality images even when playing back in extended play (3x) mode.

* OA stands for Office Automation and means products such as word processors and fax machines that make paperwork efficient by automation. PA means the personal version of OA products, targeting individual consumers.

3 Promoting Multimedia for Personal Use

Development of Electronic Organizers

■ IC Cards Instead of Refill Pages

At a time when organizers (i.e., day planners) with refillable pages were popular, Sharp began developing an electronic version of the organizer that used IC cards to expand its capabilities.

A prototype was completed in July 1986, but its commercialization was delayed. Since it could display only *katakana*, Sharp deemed it insufficiently user-friendly. After further development, the world's first *kanji*-capable electronic organizer, the PA-7000, was introduced in January 1987. The PA-7000 also had five personal information management functions: a calendar, a scheduler, a memo function, a phone book, and a calculator.

With IC cards to expand functionality, users could add functions they wanted, such as a dictionary or English conversation guide. The organizer drew rave reviews for its ability to display *kanji* and became a huge success. With the aid of sales promotion efforts, it sold 500,000 units in a single year.

■ “Bware” Intellectual Information Tools

In 1988, Sharp commercialized a series of mobile information tools, including electronic organizers, under the brand name of Bware (“Business Ware”). These products were targeted at businesspeople living in an information-intensive society and wanting to utilize that information anytime and anywhere—whether they were on the move or at their destination of the day.

Initially, Bware products used IC cards that were developed by Sharp. But the company made the source code for the devices open to the public, so that software companies and publishers could develop and sell their own content. Sharp also introduced the Program BASIC Card to enable retailers and general users to create their own applications. Sharp electronic organizers were received so



Sharp electronic organizers steal the show at the 1987 Data Show in Tokyo

well that by August 1990 total shipments in Japan had reached four million units.

Evolution of the Japanese Word Processor

In the beginning, the process of inputting text in a *kana-to-kanji*-converting word processor required inputting by clause. The converter often suggested inappropriate *kanji* characters, as there are many combinations with the same pronunciation. In order to solve this problem, Sharp designed a connected-clause conversion method that suggested *kanji* characters based on an evaluation of the content of the surrounding clauses. In the case of the word “warm,” it could change the suggested *kanji* character depending on whether it was connected to “room” or “food.” Further, the company developed an artificial intelligence (AI) dictionary—which included about 40,000 examples—to increase the accuracy of the connected-clause conversion.

In May 1987, Sharp introduced the WD-540 word processor, which was loaded with the AI dictionary. This was followed in the same year by the introduction of the WD-820, which featured a large backlit DSTN LCD, and the WD-850, which had the industry's first large EL display. In 1988, Sharp introduced a laptop word processor, the WV-500. To achieve the smaller and lighter design of this model, the word-processor section was separated from the printer.

In May 1989, Sharp's cumulative production of word processors reached two million units. Sharp continued to fulfill customer expectations by introducing new products, one after another. In 1990, the company released the WD-A340, which included Super Outline Fonts that could be printed beautifully regardless of font size. In 1991, a business-use word processor, the WD-SD70, was introduced. It had a 17-inch LCD screen that could be oriented either vertically or horizontally for better visibility.

The WD-A340 offered quality nearing that of printed type thanks to built-in Super Outline Fonts and a 64-dot 400-dpi high-resolution printer



Creating New Style for Telephones

Facsimiles

With plateauing demand for facsimile machines in the business market, Sharp shifted focus to the home market. October 1990 saw the introduction of the UX-1, which was made to be as small, thin, and light as possible and which could be set up beneath a telephone. The model's nickname, Illustalk, reflected Sharp's effort to promote sending illustrations by facsimile as a fun new way of communicating. Advertised with the catch phrase, “A better way to communicate than words,” it was well received and helped popularize home use of facsimiles.



The UX-1 was a stylish home-use fax that redefined information equipment (phone sold separately)

Telephones

In April 1985, NTT was privatized, and the market for telephone equipment was opened up. Responding to this change, Sharp established the Communication Audio Division inside the Audio Systems Group. The following year, the company introduced an answering machine.

Next, Sharp entered the cordless phone market. Cordless phones were divided into two types—the ultra-low-power type (for communication distances within 10 meters) and the low-power type (for communication distances within 100 meters). Sharp introduced the ultra-low-power CJ-S30 in December 1987 and the low-power CJ-S100 in April 1988. The latter was priced at 89,800 yen—significantly lower than the prices of competing models—as Sharp had made the key components in-house and had automated its production. Later, Sharp focused on the low-power type that could provide more stable communication.

In September 1989, the company introduced the industry's first low-power cordless phone with an answering machine, the CJ-A300. It was developed in just six months through cooperation between the development teams for cordless phones and answering machines. In April 1991, Sharp's cumulative production of cordless phones reached two million units. The expansion of the business was extremely fast.



The CJ-A300 could control answering machine functions via the handset and make calls from the base unit, which was not possible on previous models

Efforts in Computer Products

Scanners

In July 1986, Sharp introduced a desktop-size high-precision color scanner, the JX-450. It became popular in the design and fashion industries, gaining status as the global standard.

Copiers

In 1989, Sharp introduced its first full-color copier, the CX-7500. The year 1991 saw the release of the SD-2075, a high-speed copier that could output 76 copies per minute with air paper feeding and a form feeder function. In fiscal 1991, the worldwide production of Sharp copiers reached 500,000 units a year and cumulative sales surpassed 3.6 million units.

System Products

In the POS terminal market, the RZ-5100 series (for gas stations) increased efficiency for software development by using a multitasking general OS. Sharp also released the RZ-5800, which could handle bar-code input. In the handy terminal market, the RZ-5550, with a touchscreen LCD, and the RZ-5541R, with wireless communication capability, were commercialized in rapid succession.

PCs

In March 1987, Sharp introduced the X68000 series, which had evolved out of the X1 PC-TV. Natural color graphics—with 65,536 colors—and superb sound quality suited for games made this product popular for personal use. It was supported in particular by dedicated fans and remained popular even after sales ended. In July 1988, the AX386 was released, featuring a high-resolution display. This model was an AX (architecture extended) PC based on common specifications developed by a consortium of Japanese electronics companies. Sharp enhanced its PC lineup by introducing models such as a laptop type and a laptop type with a color LCD.

English-to-Japanese Translation System

Sharp succeeded in developing an industry-first, English-to-Japanese translation system for minicomputers and exhibited it at the Business Show in Tokyo in 1985. In September 1988, the DUET E/J was introduced. Onboard AI technology enabled it to achieve high-level semantic/language processing. It could also automatically read English text through optical character recognition (OCR).

School Education Support System

In 1984, Sharp began developing an education support system for elementary schools and junior high schools in cooperation with, among others, Professor Kazuhiko Nakayama from the University of Tsukuba. Initially, the system comprised mainly hardware; but positive feedback about the system prompted the development of software that could be used for other manufacturers' PCs. Thus, Sharp System Products (SSP) developed classroom/learning support software that utilized networks and supported the creation of teaching materials. This software was introduced in 1990. With schools moving forward in response to the information age, sales increased and the business expanded.

4 Positioning LCDs as the Core Business

Strengthening Development and Production Systems for LCDs

■ Establishing the Liquid Crystal Display Division

In 1985, Sharp succeeded in creating a prototype for a 3-inch LCD color TV. The final decision was made to build a plant for thin-film transistor (TFT) LCDs and the company organized a Sharp Taskforce to study methods for mass production. Manufacturing of TFTs is similar to that of LSIs in terms of the construction of transistors. Initially, the company considered building a facility for a 6-inch (15 cm) wafer size, which was the standard for LSIs at that time. However, Sharp was aware from its experience in manufacturing LCDs for electronic calculators that creating multiple panels from a single glass substrate was important in terms of cost efficiency. Therefore the company insisted upon using the larger A4 size (14.3 inch [36 cm] diagonal) glass substrates that had been used for production of passive-matrix (duty) LCDs. Sharp had also heard about the prospects for development of a large exposure device suited to this purpose, and it made the decision to use the A4-size substrates.

In 1986, Sharp exhibited a 3-inch TFT LCD TV with about 92,000 pixels at the Japan Electronics Show in Tokyo. The high image quality, which had not existed previously, drew a great deal of attention.

■ Thoroughly Examining the Potential for LCD Application Products

As well as further developing LCDs themselves, Sharp extensively reviewed the potential of products utilizing LCDs. For example, the company considered new products such as in-vehicle TVs and projection TVs. Sharp made the decision to utilize LCDs to open up business areas with new products while developing the LCD business itself, following a corporate strategy based on uniqueness, social contribution, and feasibility.

In January 1986, the LCD department was upgraded to the Liquid Crystal Display Division—an indication of the company's determination to focus on LCDs. At the TFT LCD plant, efforts were made to improve the efficiency rate and the quality of production. In October 1987, Sharp released the 3C-E1 3-inch LCD color TV.

■ Development of the 14-Inch Color TFT LCD

In the process of establishing production technology for 3-inch LCDs, Sharp also took on the challenge to create a 14-inch LCD, utilizing the entire glass substrate. The company decided to investigate how well the thin film would form and to see if there would be defective transistors created in making a large TFT LCD panel using the entire surface of the glass substrate. In the initial stages, the efficiency rate for 3-inch LCDs was low and



The 14-inch color TFT LCD was a sensation at the Japan Electronics Show in 1988

the success rate for 14-inch displays was close to zero. Sharp continued to try different approaches, such as using multiple wiring to the pixels or dividing the pixels into four and using multiple transistors. Finally, Sharp's first prototype 14-inch color TFT LCD was completed in 1988. The 14-inch size was the best-selling size for portable CRT TVs; this new LCD had the same screen size but with amazing dimensions. It had a thickness of just 27 mm—one-thirteenth as thick as a conventional CRT TV—and it weighed just 1.8 kg. This success cemented Sharp's decision to begin full-scale operation of a large-size LCD business; in 1989, the company started building a large-size TFT LCD production line (the NF-1 line) at the Tenri Plant. The company also decided to build a plant in Mie Prefecture. In April 1990, the Liquid Crystal Display Division was upgraded to the Liquid Crystal Display Group.



The LCD plant in Tenri, where large, high-quality TFT LCDs were efficiently produced

■ Establishment of the DSTN Passive-Matrix LCD Business

STN (super twisted nematic) LCDs were used for the first time in the WD-250 word processor, which was released in 1986. It offered good contrast, but the yellow-

green cast of its display made onscreen objects look quite different to those printed on paper. The company therefore aimed to produce a "paper-white" display by eliminating the color cast. In order to accomplish that, the LCD was overlapped in two layers to reverse the light twisting. Beyond merely creating this structure, Sharp's research extended to examining around 2,000 different liquid crystal materials and the effects of polish quality on the LCD glass. In the end, Sharp succeeded in developing DSTN (double super twisted nematic) LCDs, which appeared "paper white." In 1987, DSTN LCDs were used for the WD-820 word processor. The model's easy-to-view display played a large part in helping Sharp to increase its market share.



The WD-820 word processor had a revolutionary easy-viewing "paper-white" display



Display of conventional STN LCD

In 1987, Sharp's yearly shipments of word processors surpassed 500,000 units. In 1988, the company succeeded in creating a color version. Duty LCDs, which were increasingly being used for office automation products, became a driving force for the LCD business.

Developing Ever More LCD Application Products

■ Debut of the LCD Projection System

Sharp proceeded to aggressively develop LCD application products. LCDs became widely used for the displays on information products such as word processors and electronic organizers, as well as on phones, copiers, VCRs, humidifiers, and many other products. This contributed to the improved operability of the products.

In 1989, Sharp introduced an LCD projection system—the XV-100Z—that made it easy to create a 100-inch display. Offering a dynamic visual experience at home, this product received the grand prize at the 1989 Nikkei Outstanding Products and Services Awards. SEC, Sharp's sales company in the US, actively engaged in sales promotion by touring the country with a XV-100Z loaded on a large trailer to create a mini theater.

Meanwhile, Sharp introduced the VL-C860 video camera with a color LCD viewfinder—an industry first. The viewfinder was different from conventional black-



Home theater with the XV-100Z LCD projection system

and-white viewfinders, as users could identify objects by color. Customers reported their satisfaction at being able to, for example, identify their child at a school sports festival. The video camera had a high resolution of 70,400 pixels per inch, achieving both high contrast and detailed image quality.

Sharp also introduced the AX386LC color TFT LCD laptop PC in 1990.

■ Creating the World's First Wall-Mount TV

In 1991, Sharp introduced the industry's first wall-mount TV, the 9E-H series. It utilized the largest screen in the industry at that time, an 8.6-inch color TFT LCD. It was stylishly designed to enhance interior décors, and the media reported that the "dream wall-mount TV has finally arrived."

The production value of LCDs was only 8.9 billion yen in fiscal 1986 when the Liquid Crystal Display Division was established. Following that, the markets for LCDs and LCD application products both grew and reached 180 billion yen in fiscal 1993. In short, the LCD business had grown by 20 times in just seven years.



The industry's first wall-mount TV, the 9E-HC1

5 Confidence in Optoelectronics

Advancing in the Optoelectronic Device Business

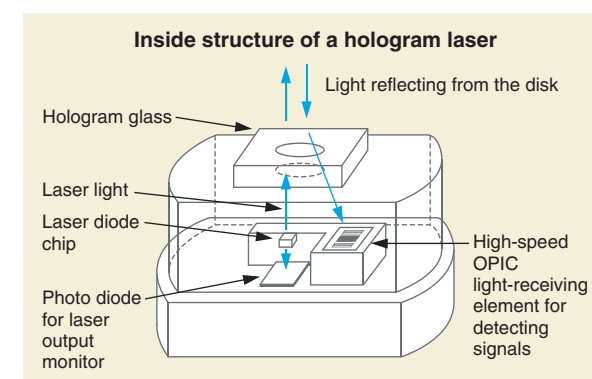
In 1988, Sharp made it clear in its basic corporate policy that it intended to become a comprehensive electronics company with optoelectronics as its core technology. The company had already achieved a large market share in optoelectronic devices in Japan.

Around this time, there was a widespread increase in technologies that could process high volumes of information using light—for example, fiber-optic communication devices and compact discs. Also, the market for LCDs was growing fast.

■ Advancing in Lasers

In 1981, Sharp began mass production of laser diodes for pickups (readers) used in CD players. The company reportedly achieved an 80% market share for laser diodes installed in CD players released in 1982.

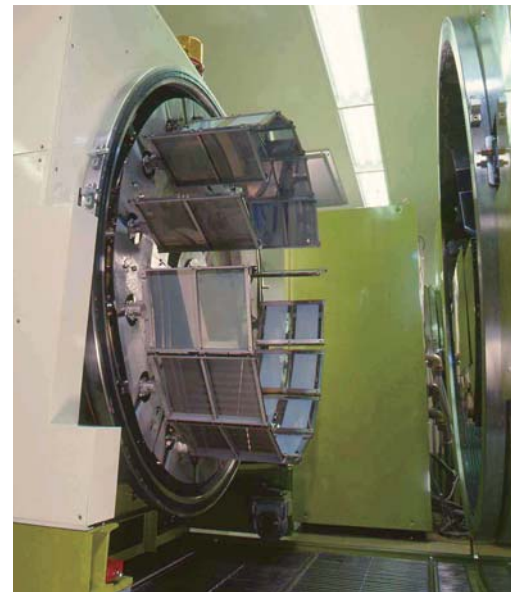
The company endeavored to develop a new method of growing crystals—the vapor deposition method*—that would increase power output and productivity. In 1987, Sharp developed the low-current quantum well laser. The following year, Sharp developed a hologram laser unit in cooperation with Philips International B.V. of the Netherlands. This new product was made by housing together in a single package the laser element (the light-emitting part)—which had previously been an independent device—and the signal-reading element (the light-receiving part). This product made it easier to assemble pickups and also reduced the process of optical adjustment after assembly, contributing to lower costs and smaller product sizes. Sharp increased its market share in lasers.



■ Progress in LED/EL

LED

Sharp developed an ultra-high-luminance, 5,000 mcd (millicandela) LED lamp in 1987, expanding the application of LEDs to electronic billboards, tail lights for automobiles, and other uses.



EL panel deposition device that put a thin film coating on a glass substrate by high-temperature vacuum deposition

Inorganic EL

Sharp overcame the issue of service life in the development of thin-film electroluminescence (EL) technology, to make it suitable for practical applications. Sharp's 10-inch display from 1987 achieved high image quality and low power consumption not found on CRTs. The company made progress in utilizing it for factory automation (FA) products and other applications. In 1989, Sharp also developed an EL display capable of processing handwritten text that users could input as if they were writing on paper. This was achieved by simultaneously detecting the coordinates of the stylus pen and displaying input on the EL panel. In 1988, Sharp was awarded the Karl Ferdinand Braun Prize from the Society for Information Display (SID) for pioneering the development of stable, high-luminance thin-film EL displays.

■ Steady Growth in RF (Radio Frequency) Components and Mask ROM Business

Sharp developed a DBS tuner for satellite broadcast receivers. Its reliability and functionality were regarded highly and many orders came in from Europe, North America, and other areas. In the mask ROM business, the company responded to the needs of videogame and OA product manufacturers for higher speed, larger storage capacity, and faster delivery. In 1994, the company's domestic market share reached 41.9%.

Technological Advances in Solar Cells

■ Progress in Conversion Efficiency

The biggest issue for solar cells is the power generation cost, and improvement of conversion efficiency to reduce this cost has long been a challenge in the field.

In 1989, Sharp achieved a practical conversion efficiency of 17.1%—the best in the world at the time—for terrestrial-use monocrystalline silicon solar cells, and in 1991 it achieved a 20.4% conversion efficiency at the research level. This was made possible by bringing together a number of advanced technologies, including thin-film control technology to improve absorption of surface light; optical diffusion control technology to efficiently convert absorbed light to electrical current; and technology for maximizing efficiency in the formation of the back-side aluminum electrodes that prevent light from going through the back of the solar cell.

For the cheaper-to-produce polycrystalline type of solar cell, Sharp worked on improving conversion efficiency by developing technology for sandwiching a layer of stabilized SiO₂ (silicon dioxide) on the surface of the solar cell and creating a reflection-prevention film.

■ Solar Cells in Action around the World

Leading the industry in terms of conversion efficiency and other aspects, Sharp's solar cells contributed to people's lives in various places. Three solar power generation plants were installed in Thailand in 1986, supplying electricity to 240 households in three off-the-grid villages and greatly pleasing the 2,500 residents. These power generation plants were installed with grant assistance from the Japanese government. For space missions, Sharp's outer space solar cells were adopted for satellites such as the Fuji in 1986 and Kiku No. 5 in 1987.

Expansion of Device Sales

■ Sales Promotion Activities for Devices

Laser diodes strengthened Sharp's brand power in electronic devices. In order to further boost the brand and gain more orders, Sharp held its first electronic

components trade show in the Tokyo metropolitan area in 1987, with the exhibit centered on IC-related products—such as CCDs, microcomputers, and memory devices—along with other unique products such as LEDs and color LCDs.



An electronic components trade show was held at Sharp's head office as well

■ Urged to Purchase Foreign Products

In 1985, the Japanese government requested industry to increase imports and this called for the increased utilization of imported semiconductors. Sharp held a joint exhibition with foreign semiconductor manufacturers in 1989 to promote sales of imported semiconductors.

This exhibition contributed not only to the increased sales of new components but also to the exchange of technical information, benefiting both foreign semiconductor manufacturers and Sharp.

* The vapor deposition method is a method of growing crystals on a substrate surface by condensing the vaporized form of the material.

Columbus Sails the Nation Promoting Sharp

For 18 months starting in June 1988, the Sharp Columbus, a 2,800-ton ship, visited a total of 72 ports around Japan including Kobe and Yokohama and was boarded by a total of 1.37 million people.

Inside the Columbus, visitors could experience Sharp products like high-definition TVs, EL displays, and laser diodes, and see lifestyle/office-style exhibits featuring the latest models of Sharp audio-visual and office equipment. Everywhere the ship docked, it was enthusiastically welcomed by harbor masters and local mayors. About 600 media organizations came by to do stories on this Sharp promotional vessel.

Also at each port of call, Sharp held negotiations with dealers and joint sales exhibitions for customers, making the tour an excellent opportunity to sell Sharp products.



The Columbus (top) and a bustling product exhibit inside (bottom)

6 Seeking the Best Locations for Production and Sales

Enhancing the Network of Sales Bases

■ Taking on a Difficult Environment in Production and Sales

The Plaza Accord on September 22, 1985 triggered a sudden and dramatic increase in the value of the yen. However, that change didn't fix the US trade deficit with Japan, and trade friction between the US and Japan didn't subside at all. In 1986, the two countries reached an agreement on the trade of semiconductors. In the following year, the US enacted a 100% tariff on color TVs and PCs, claiming that Japanese companies had violated the agreement. Affected by these developments, Sharp's exports in fiscal 1986 decreased to about 80% of those in the previous year. In 1989, the Japan-US Structural Impediments Initiative was held to correct trade imbalances. Similarly, European markets moved to restrict imports of products such as VCRs. Under these difficult circumstances, Sharp made progress in production and sales based on a concept of the "best locations for production and sales."

In Europe, where the integration to the European Union (EU) was set to commence in 1992, Sharp bid to improve its market responsiveness by adding six new sales organizations—making nine sales subsidiaries in nine countries. In 1990, the company established a financial subsidiary, Sharp International Finance U.K. Plc. (SIF) in the UK. By managing financing for the European subsidiaries in one place, Sharp minimized the negative impact of currency exchange fluctuations and effectively raised and managed funds.

In the US, Sharp released a new product, the facsimile, in 1985. Starting from 1987, it kept the top market share for 11 consecutive years (based on a Dataquest survey). The company also kept the top market share for 11 consecutive years in the sales of microwave ovens, starting from 1990 (based on a Trendata survey).



In developing a network of dealers for office products and communication equipment, Sharp expanded the market for business-use facsimiles. (Photo shows FO-800 fax)

Sharp also established new sales bases in the Asia and Pacific regions and continued to improve its product and marketing strategy to fit the needs of the regions.

Further, in February 1987, the Overseas Business Group, product divisions, and overseas sales subsidiaries held their first joint product strategy and management policy review. Lively discussions were held regarding sales plans, marketing initiatives, and trade issues.



The first product strategy and management policy review was held in 1987. Six sales companies from overseas (SEC, SEEG, SECL, SCA, SUK, SRS) participated.

In 1988, a new in-company English-language periodical called *We're Sharp* was launched to keep close communication with employees and their families at manufacturing and sales subsidiaries around the world. A Chinese edition has been published since 2004.

■ Company-Wide Efforts to Increase Imports

In August 1985, Sharp established an import company, Sharp Trading Corporation (STC). In that year, the Ministry of International Trade and Industry (now METI) took measures to adjust Japan's balance of trade surplus by asking 60 major companies to increase their imports of products. Through STC, Sharp made company-wide efforts to increase the number of items imported—including components and products made at Sharp's overseas bases, as well as general consumer goods—while increasing sales volume in order to stabilize and develop overseas operations. As a result, imports by Sharp surged from approximately 4.3 billion yen in fiscal 1984 to 29.8 billion yen in 1991. The company created a virtuous cycle by connecting with overseas markets more tightly through imports and exports.

Localization of Production Facilities

Sharp's company-wide plans were formulated in line with a division of production facilities into two categories: production facilities for local consumption (where the primary purpose was sales in that country or region) and production facilities for re-export (where the primary purpose was for export to third countries).

■ Efforts to Become Part of the Local Community

In markets in Europe and North America, the focus was to ease trade frictions while continuing to secure the company's position in those markets. The company also made efforts to contribute locally by hiring local staff.

SMCA in the US began production of PCs and LCD projectors in addition to microwave ovens and color TVs. SMCA's microwave ovens were also exported to Europe. As a result of progressive improvements in quality control (QC) and streamlining and automation of manufacturing, the cumulative number of color TVs and microwave ovens manufactured by SMCA reached 10 million units in November 1988, in just eight or so years following the company's establishment.

Sharp developed production facilities in Europe as well, but Japanese companies (including Sharp) were criticized by EU nations claiming that they performed the value-added process in Japan and then merely had the products assembled in Europe. Responding to this, Sharp strengthened local design technology divisions and made efforts to increase the portion of locally procured components.

SUKM in the UK began manufacturing electronic typewriters, copiers, and CD players—in addition to VCRs and microwave ovens—and expanded its business by exporting to EU nations. SUKM was awarded the 1990 Queen's Award for Export and Technology in recognition of its contribution to increasing exports from the UK. It was rare for a foreign company that had been in operation for less than five years to receive the honor. It became big news, with SUKM receiving a lot of praise.

■ Active Enhancement of Re-Export Bases

Re-export bases, mostly in Asia, were expected to bring two benefits. By replacing exports from Japan, they helped to ease trade friction. They also helped to establish a system where profits could be made even with the strong yen. Actively enhancing re-export bases enabled Sharp to secure an inexpensive but excellent workforce and procure high-quality materials at lower costs. Sharp was able to dramatically increase its competitive position in terms of pricing. SREC in Malaysia was even awarded the 1987 Export Achievement Award from the Malaysian government for its contribution to the growth of the country's industry. Sharp was responsible for 14% of Malaysia's exports of electric and electronic products and was seen as an industry leader in that country.

Sharp also established Creative Lifestyle Focus Centers in the US in 1986 and in West Germany in 1987 to expand its development of lifestyle-based products, which had been achieving strong results in Japan. The company researched the needs of local markets and worked both to develop new products locally and to redevelop mature products.



The ultra-thin VL-50C video camera, developed at the US Creative Lifestyle Focus Center

Sharp overseas manufacturing and sales bases established between 1986 and 1991

(Business activities are those at time of establishment)

● Sales base ◆ Manufacturing base

	Company name	Country or region	Business activities
1986	● Sharp Electronics (Schweiz) AG (SEZ)	Switzerland	Sales of office equipment
	● Sharp Electronics GmbH (SEA)	Austria	Sales of consumer electronics and office equipment (incorporated into SEEG in 2004)
	● Sharp-Roxy Sales (Singapore) Pte., Ltd. (SRS)	Singapore	Sales of consumer electronics and office equipment
	●◆ Sharp Electrónica España S.A. (SEES)	Spain	Manufacture and sales of color TVs, sales of consumer electronics
	◆ Sharp Electronics Taiwan Co., Ltd. (SET)	Taiwan	Manufacture of electronic tuners (business stopped in 2008)
1987	◆ Sharp Appliances (Thailand) Ltd. (SATL)	Thailand	Manufacture and sales of microwave ovens and refrigerators
	● Sharp Electronics (Singapore) Pte., Ltd. (SESL)	Singapore	Supply of components and kits for Sharp manufacturing bases
	● Sharp-Roxy (Hong Kong) Ltd. (SRH)	Hong Kong	Sales of consumer electronics and office equipment
1988	● Sharp Corporation of New Zealand Ltd. (SCNZ)	New Zealand	Sales of consumer electronics and office equipment
	◆ Sharp Precision Manufacturing (U.K.) Ltd. (SPM)	United Kingdom	Manufacture of precision press components (business stopped in 2005)
1989	◆ Sharp Manufacturing France S.A. (SMF)	France	Manufacture of copiers and facsimiles
	● Sharp Thebnakorn Co., Ltd. (STCL) (Name changed to Sharp Thai Co., Ltd. [STCL] in 2007)	Thailand	Sales of consumer electronics and office equipment
	●◆ Kalyani Sharp India Ltd. (KSIL) (Name changed to Sharp India Limited [SIL] in 2005)	India	Manufacture and sales of color TVs and VCRs
	◆ Sharp Manufacturing Corporation (M) Sdn. Bhd. (SMM)	Malaysia	Manufacture of VCRs
1990	● Sharp Corporation (Taiwan) (SCOT)	Taiwan	Sales of consumer electronics
	● Sharp Burotype Machines S.A. (SBM)* (Name changed to Sharp Electronics France S.A. [SEF] in 1991)	France	Sales of office equipment
	● Sharp Electronics (Italia) S.p.A. (SEIS)	Italy	Sales of consumer electronics
1991	● Sharp Electronics Benelux B.V. (SEB)	Netherlands	Sales of office equipment

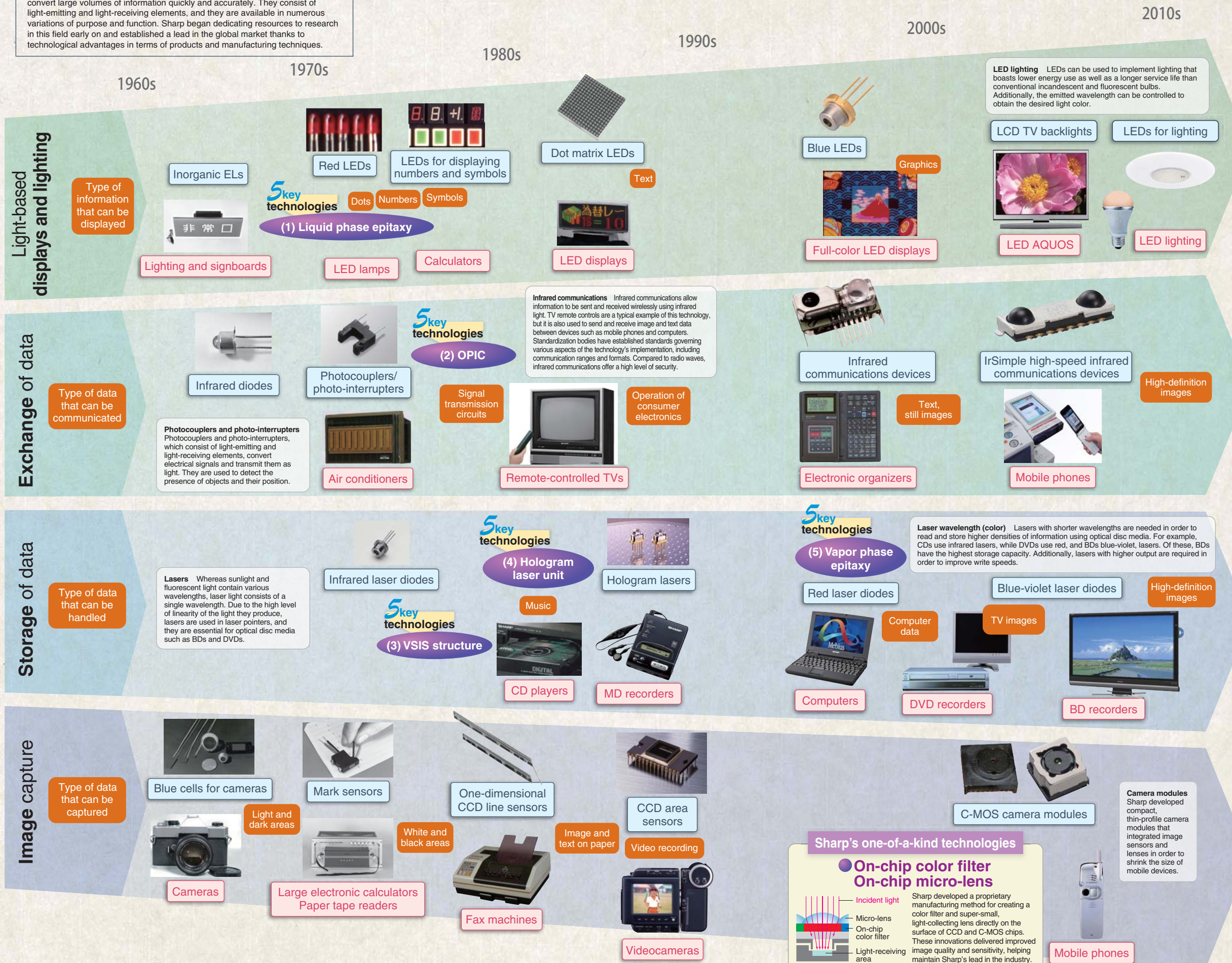
The year of establishment is the year the company was registered. * For SBM, it is the year Sharp acquired a local dealer and made it a sales subsidiary.

What are optoelectronics devices?

Optoelectronic devices—semiconductor components that combine optics and electronics—have played a major role in the development of an advanced, information-based society thanks to their ability to communicate, store, and convert large volumes of information quickly and accurately. They consist of light-emitting and light-receiving elements, and they are available in numerous variations of purpose and function. Sharp began dedicating resources to research in this field early on and established a lead in the global market thanks to technological advantages in terms of products and manufacturing techniques.

Developing along with Application

Products: Optoelectronic Devices



Sharp's One-of-a-Kind Technologies That Bolster Its Lead in Optoelectronics



1 Liquid phase epitaxy (Manufacturing technology)
 This method for forming light emitter p-n junctions at the same time as crystal is grown allows growth of extremely high-quality crystal. Sharp's patents in the area of crystal growth propelled the company to a leading position in the industry.

2 OPIC (optical IC) (Product technology)
 OPICs integrate a light-receiving element and signal processing circuit onto a single chip. Integration with an IC reduces the effects of external interference and allows output signals to be directly linked to a microcontroller. The design was instrumental in the development of more compact, more reliable, and more inexpensive devices.

3 VSIS structure (V-channeled substrate inner stripe) (Manufacturing technology)
 The creation of a V-shaped groove on a P-type gallium arsenide substrate allows the formation of a series of thin layers, providing stable laser light with a long service life.

4 Hologram laser unit (Product technology)
 A hologram laser unit incorporates a light-emitting laser element and a light-receiving signal-reading element into a single package. In addition to allowing more compact pickups, the design is distinguished by its reduction of the need to perform optical adjustment during the assembly process.

Inside structure of a hologram laser

3 Vapor phase epitaxy (Manufacturing technology)
 Vapor phase epitaxy technology is used to form thin films by growing crystals of the vaporized material on a substrate. Sharp has drawn on its expertise in the area of crystal growth technologies to establish a lead over competitors and seize high market share.