

Design Strategy for LCD-Applied Products

Masaki Nishino*¹

Seiji Toyoshima*²

*1 Corporate Design Center

*2 Planning Dept., Corporate Design Center

Abstract

With the progress of information society LCD-applied products are spreading more and more. While Sharp has been producing many LCD-applied products, we have also developed many product-designs with unique concepts or ideas. In this background, there are some design strategy including proposals for new applications of LCD from the viewpoint of end-users and new product concepts from the standpoint of design, and also the prior design measures for Interface Design utilized LCD.

This paper describes an outline of Sharp's design strategy for LCD-applied products and the points of design development by the individual development product example.

Introduction

With the rapid progress in networks and digitalization, the trend of an information society has been spread not only in the business field but also in personal/home applications. Information itself has been transforming its form into multimedia, combining audio sound and visual image. While this transformation is under way, suitable tools with versatility and flexibility, besides computers, are required to handle the different kinds of multimedia information. LCD is a device that is most likely to perform as an interface between users and information, meeting the above needs. SHARP, as a leading company of LCD devices, has made continuous efforts on the development of LCD-applied products and attempted to create those products that are easy to use for everyone. In the process of product design development we are trying to describe new life/business style by utilizing LCD-applied products from the users' view point.

1. Outline of the Design Strategies for the LCD-Applied Products

This paper reviews the design strategies particularly for the LCD-applied products.

The LCD-applied products are divided by two types.

One is a "Re-Developing Type", which creates entirely new values to develop a product by focusing on the functions and then changing the usage after the close examination of the existing products. The other is a "Category-Creating Type" to create a brand-new category where an

existing product has never been used before. In any case we are developing the product design with the following policies.

(1) To provide new usage or convenience that changes users' life/business style:

Because the liquid crystal display itself is only a material, it does not show a perfect performance by itself. The products that it is applied to can offer new amusement or convenience in the users' life. The role of design is to provide users with more functions and techniques in a form of a device or interface, therefore, the suggestions and ideas on usage and operational ease are to be actively proposed from the user's point of view.

High-level design development can be made through such procedures based on ideal specifications of applicability: first, to form possible ideas and suggestions for an actual image of a new product from an early stage of product design; secondly, to evaluate it from the view point of users or marketing factors; and then to focus on the technical challenges.

(2) To make full use of the advantages of LCDs:

LCDs originally have superior characteristics in thinness, compactness and communication-capability. A new product can be differentiated from others by a new, interesting style of design, taking advantage of the product's strength. When it comes to products of portability, these characteristics are determinative.

(3) To perform as an interface through active use of an LCD screen:

The LCD has versatile advantages of display performance and communication capability, which expands its operability when used as an user-interface. Therefore, the product design includes not only the design of hardware but also the design of GUI (Graphical User Interface). GUI plays an important role in determining whether a certain product is easy-to-operate. At SHARP's design centers, the product design is carried out with both approaches. We have established a specialized group for the GUI design. They perform the product design development under the collaboration with hardware design groups.

(4) To perform as a basic type of tool in a new product category

"Re-Developing Type" products or "Category-Creating Type" products are both intended to propose new product usage or lifestyles. New designs are developed when these new concepts are optimized. It is also important not only to focus on seeking novelty, but also to create one basic type of the product, which is firmly rooted in its fundamental functions. Our Zaurus and ViewCam are good examples to prove that these approaches are successful.

2. Hints of the LCD-Applied Product Design

This chapter reviews the hints of the LCD-applied products design, taking actual SHARP's products as references.

2.1 ViewCam

The starting point in designing a SHARP ViewCam was to create a flexible movie camera that could take images as they are seen, without the limited performance caused by the viewfinder. <Take (images)>, <View (images)>, and <Enjoy Together (the taken images)> were the key words when the ViewCam was developed as a new type of communication movie camera in which everybody could enjoy together what they have taken. Versatile simulations were considered during this process, in which one can take images with operational ease, one can also take his/her own image, and one can even check on the LCD screen while taking images. All these made it possible for SHARP ViewCam to become a today's basic style of image-taking device with its rotatable lens which was completely different from conventional movie cameras.

Further improvement was made to reduce the number of operational buttons on the ViewCam VL-HL1 (**Photo 1**). The new design was employed to locate the operational buttons aligned with other operational displays on the LCD

screen. This enabled the users to operate the ViewCam while making sure of the actual operation at the same time. The result was that the ViewCam VL-HL1 received positive support from a wide range of users including beginners, the aged and housewives.

The basic concept remains even after new versions that offer digital performance and further compactness have been developed. The latest version, the Digital ViewCam VL-DC3 comes with digitized functions and compact size, and the operation has been made easier with employment of the GUI and cursor button, resulting in a simple design with less operational buttons on the product (**Photo 2**). The ViewCam has brought a new field of "Movie camera with LCD" to the market that dominates 90% of the movie camera share (as of September, 1997).



Photo 1 The first generation View Cam VL-HL1.



Photo 2 Digital View Cam VL-DC3.

2-2 MD (Mini Disk) Data Camera

SHARP MD Data Camera is the first digital camera in which an MD was employed as a recording media. The users can take full advantage of its high performance and functions to customize it. Recording capacity is up to 2,000 images, and the MD Data Camera not only records still images but also audio sound. The recorded images can be edited on the LCD screen. It may be connected to a personal computer and also perform as an audio MD, providing record/play functions.



Photo 3 MD Data Camera MD-PS1.

An LCD screen and shape of MD package are considered as basic design elements. In order to develop easiness to hold the camera some mock-ups are used to check the location of the lens or strobe. Furthermore a slip-resistance, special paint containing collagen-fibers was applied in areas touched with the hand.

Operational design is systematized into sound & image and record & play to organize numerous functions of the product. The operational buttons are located around the LCD screen, based on functions. The GUI is applied on the LCD screen. This makes it easier to carry out complex operations such as editing.

The PC-link software is compatible with the camera GUI to allow simple operation as a total system (**Photo 3**).

2-3 Portable Information Tool: Power Zaurus

The portable information tool (PDA: Personal Digital Assistant) is an advanced form of an electronic organizer, which SHARP originally developed. Its style was transferred from convenient paper-made organizers.

SHARP Power Zaurus, on the other hand, came from nowhere: it was designed as a thoroughly new tool for the information society. Its design concept, "Personal Mobile Tool" was to provide entirely new functions that an electronic organizer does not provide.

For example; the pen-based input system allows the Power Zaurus to recognize handwritten data and replaced a keyboard. The large LCD screen offers crisp images and numerous character display. The Power Zaurus has an enhanced communication capability.

The above mentioned functions were taken into consideration in early development stage of Power Zaurus. A series of portable size products simulations were created to come up with today's Power Zaurus design. Usability testing simulations were done to measure the design performance of the product in different scenarios (for example; while walking, traveling on a train, etc.). Other simulations included measuring the user's perception regarding the products use in many different given situations (for example; removes the cover, takes out the pen tool, and data input onto the screen, etc.). These usability tests helped to create this basic design: oblong shape, the holding part on the left side of the main body, a cover that can open wide to its back, and a pen-tool storage that is allocated in front to take out a pen-tool with ease. These details are now incorporated into a typical design for a pen-input base PDA (**Photo 4**).



Photo 4 Power Zaurus MI-506DC.

With regard to the GUI, the interface design was made optimal for pen-input. (**Photo 5**).



Photo 5 GUI design on screen of Power Zaurus.

The latest version of SHARP Power Zaurus now offers a large color TFT-LCD screen. Enhanced functions such as Internet-base communications, PC-link, and high-speed data processing are also available. SHARP Power Zaurus is heading, step by step, to realizing the very first concept of a "Personal Mobile Tool."

2.4. LCD-Projector (Photo 6)

The starting point in developing the LCD-projector was to make possible the display of large images by means of projecting them from a small LCD. The design development was carried out, based on the concept, "Near-at-Hand Home Theater". The existing three-tube projector using CRT (Cathode Ray Tube) could offer one possible Home Theater System, but it failed to sell in large volume because it was too bulky, heavy and expensive. Additionally picture adjustment was very complicated. The main point of the new designs was compactness, mobility and



Photo 6 LCD-Projector XV-C1.



Photo 7 Microwave oven with LCD cooking guide.

operational ease of use. LCDs technology helped considerably to contribute to reduction in size, weight and price of the projector.

It can be said that these design concepts of ours have created a new product category of "LCD-Projector." Today LCD projectors are expanding their capabilities as a presentation tool with a large screen for a PC.

2.5. Microwave Oven with LCD Cooking Guide (Photo 7)

Microwave ovens are convenient cooking devices with versatile recipes loaded. On the other hand, the operation can be complex because of multiple selections and procedures.

The specific design development for interface was initiated with the idea that an LCD could help to make the operation more simple with on-screen communications. We took full advantage of the dot-matrix display performance to display not only characters but also graphics and moving images. Making the key words of "Microwave Oven with Cooking Guide", we attempted to design a microwave oven that the user can cook by means of communication with the screen. Useful cooking information is displayed, ranging from menu selections, ingredients, and preparation procedures.

At first, a product simulation was created on the computer. Later, the product simulation was tested for ease of use with a computer. This kind of testing helped us to modify the information and operation from comments provided by housewives who tested based on their expectations and experiences with existing microwave ovens.

Finally, the product gained a favorable reaction from the people tested and it became a stepping stone in developing a new market. As for the operating method, we had planned to employ a touch-screen panel, but all operations were designed to be made by buttons and rotary knobs partly because a touch-screen panel would not be appropriate for the user's hands while cooking and because the basic concept was to create simple, speedy operation.

SHARP Microwave Oven with LCD cooking guide has enjoyed sales and good reputation from users. We believe that the product turned out to be a success in providing a new area of development.

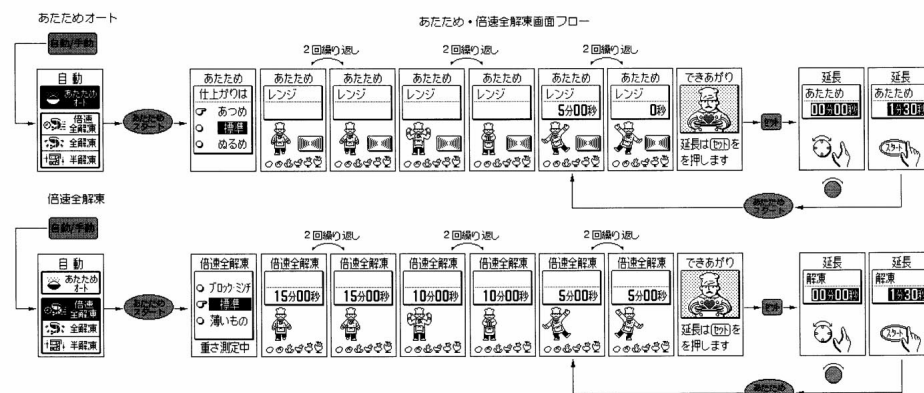


Fig.1 Apart of flow-chart to develop a GUI design for RE-CM6.

Conclusion

With the rapid progress in networks and digitalization in the future, the LCD will expand its applications as an interface device. At the same time a variety of new products will be created and used in our life. These new concepts are far beyond existing product categories today. It is crucial that these future products suit our everyday lifestyle. Now that we are entering an aging society, we believe, the aged population will find these products convenient to continue their social activities and to enjoy their lives.

In order to realize this in society the role of 'Design' will become more important. The future challenge still remains, looking for ideal designs so that people can use new products with ease, responding to the expansion of infrastructure and system.

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