Distress & Prospects for Japan's Electronics Industry

By Yaichi AOSHIMA

1. Factors Behind Changing Electronics Industry

Since the 1990s, the accelerated globalization of the electronics industry has rapidly increased the diversity of markets for manufacturers of finished products. As the market in each country has come to emerge within a very short time, manufacturers have been forced to assume diversity from the outset in developing their products. Under these circumstances, any attempt to develop optimal products for each market can hardly be justified from a viewpoint of cost. What is called for is to define a product platform of common functions applicable to markets in all countries and then work to ensure diversity for individual products. The need for such an approach has increased as the arena of competition has become globalized and price-depressing pressure has mounted.

Moreover, the practical application of digital techniques has contributed primarily to making various products mutually compatible with ease. Consequently, boundaries among conventional product systems have been increasingly blurred. Nowadays, various electronic apparatuses are mutually connected to form extensive network systems.

The evolution of major systems, set up with networks of individual products, has prompted the redefinition of the function of each individual product as a component part of such systems. Each product, so far regarded as a completed item, has now ceased to have an independent existence with a stable boundary. With the redefinition of product functions, product boundaries also continue to be mutually permeated. The development of such products with new roles and functions has to be undertaken with different concepts from those so far used. In this process, it becomes increasingly important to have the ability to continuously and flexibly redefine one's own functions with an eye to the direction of the evolution of major networks rather than to focus on faithfully responding to the requests of stable customers.

Such a change now encompassing the electronics industry has crumbled the conventional concepts of "products/parts" and "finished products/component materials," increasing the importance of redefining the functions and physical boundaries of products according to circumstances and abstracting a new "whole" and new "parts."

Electronic products mostly handle intangibles called information, and as such, can adapt themselves to the said change with relative ease. The physical shapes of semiconductor ICs have little to do with the functions of individual products. Therefore, if only functions are mutually applicable, ICs can be shared between products. Furthermore, because the semiconductor hardware of electronic products can be separated from software that controls the hardware, different requests from customers can be met by software and the need to undertake differentiation through hardware is relatively limited. This serves to facilitate the common use of hardware between different products.

Meanwhile, the rapid miniaturization of semiconductors has made it possible to markedly improve the performance of electronic products within a short time. As a consequence, it is now technically easy to meet customers' ordinary requests. This can forestall any serious worsening of performance even if the same general-purpose techniques are used among different products (or product categories) and thus no major problem necessarily arises from a viewpoint of realizing values for customers.

2. Strength & Frailty of Japan's Industrial System

Although this might invite misunderstanding, I would say that during the 1980s, the competitive strength of Japan's manufacturing industries was supported by an industrial system that integrated and synchronized a series of activities from materials and parts in the upstream to the development and production of finished products in the downstream in a sophisticated manner in order to faithfully realize values for ultimate customers.

In this process, manufacturers of finished products, who grasp the requests of the ultimate market and translate them into technical specifications, wield a strong influence over the whole industry. In each stage of the chain of values within industry, the relative superiority of manufacturers is determined by the "collation/ adjustment" ability for faithfully meeting the requests of customers – namely, downstream enterprises – and a series of collation/adjustment activities by manufacturers generate the competitive strength of the whole industry. (I would call this a "product-pull type" of industrial system in the sense that all relevant activities are put together from an angle of finished products.) *(Chart 1)*

Nevertheless, the effectiveness of the product-pull industrial system depends largely on the stability of ultimate customer requests and of the concepts of corresponding finished products. For only with the stability of aims can the gradual effort to better realize the aims acquire a value as a difference in competitive strength.

To cite the automobile industry for instance, there has been no major change for a long time in the value customers gain from products and product functions themselves for realizing such value. Given such value for

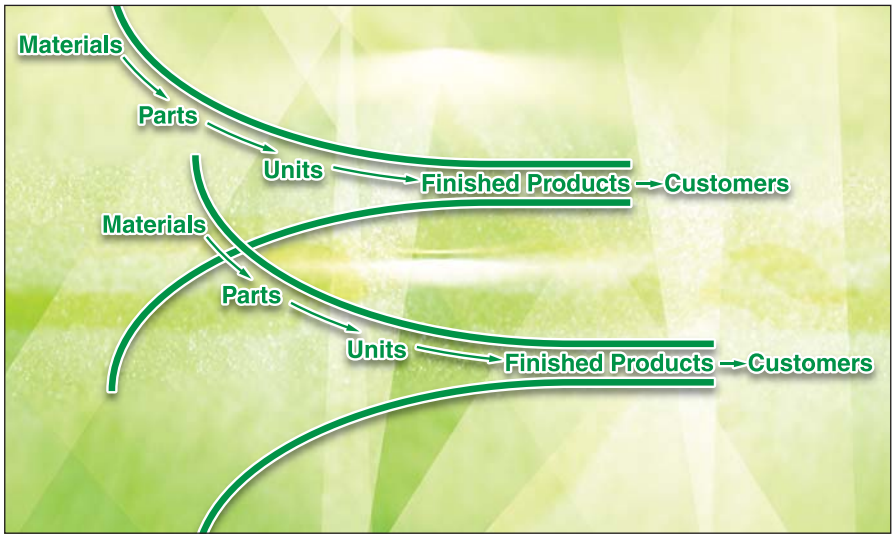
customers and product functions, the ability to faithfully translate them into reality is key.

In the electronics industry, however, the requests of respective customers are satisfied within a short time by the rapid improvement of product performance thanks to the progress of semiconductor technology, while the requests of ultimate customers become increasingly diversified. Accordingly, the effort to gradually improve performance, based on the requests of specific customers, can hardly be rewarded. Furthermore, as general-purpose modules of functions come to be shared among a large variety of products, the category stability of finished products in the conventional sense dwindles further, and the dominance of finished product manufacturers over industry weakens.

As most functions of electronic products come to be integrated into system-on-a-chip (SOC) items, many product integration functions are taken over by system semiconductor manufacturers, which supply functional modules that form the core. (SOC: A package of functions, such as processor, chip set and memory, is concentrated on one semiconductor chip.) Moreover, as system semiconductor manufacturers come to deal with diverse customers by transcending the frameworks of products and industry, information concerning the ultimate product market converges on those intermediate product manufacturers. In other words, the roles of both market integration and technological integration shift from finished product manufacturers to intermediate product manufacturers. As a result, dominance also shifts to system semiconductor manufacturers, which supply intermediate products by covering the whole range of product categories.

Corporations in such an industry are called upon to acquire the ability to define values common to multifarious customers and general functions required for such values, and construct specific units for realizing such functions. Such "ability of abstraction" is different in nature from the aforementioned collation/adjustment ability. Moreover, these two abilities are incompatible with each other in many respects. In this context, such things as products, units, parts and upper-level systems are continuously redefined in such a way as to have changing customer needs and progressing techniques correspond to each other. The effectiveness of such redefinition determines the relative superiority of corporations in this industrial system. (Let us call this industrial system a "device-push type" of industrial system.) *(Chart 2)*

Chart 1 Product-pull type of industrial system



Source : Compiled by author

It may be said that problems now confronting Japan's electronics industry mirror the inability of adaptation to the said shift from the product-pull industrial system to the device-push industrial system.

An example of this is the current stagnation gripping the digital handsets of Japan's mobile phone firms. These firms have devoted great energies to faithfully following rigorous specifications requested by NTT DoCoMo, their biggest customer in the domestic market. Not only handset makers, but also parts makers have adjusted their vectors to the realization of customer values as defined by NTT DoCoMo.

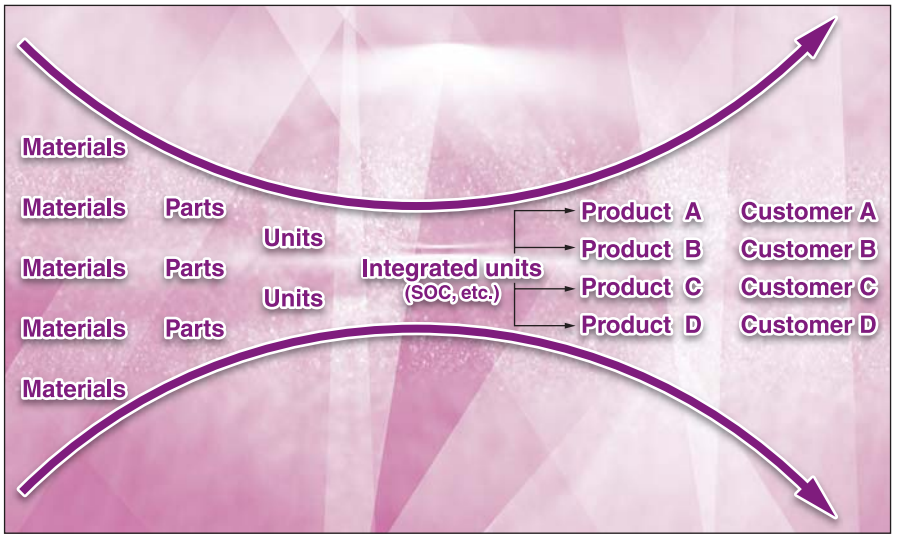
Nevertheless, the more they have faithfully followed NTT DoCoMo's requests, the more they have lagged behind in establishing platforms for efficiently coping with fast-growing diverse markets abroad. In order to have an efficient array of products on the assumption of various carriers and customers in overseas markets, it was necessary to work on general-purpose products for common use even at the sacrifice of loyalty to a specific customer. However, Japan's handset manufacturers, which focused on developing products primarily for NTT DoCoMo, could not do this.

3. Reforms Required of Japanese Firms

Under these circumstances, what is required of Japan's electronics corporations if they are to maintain their competitive strength?

One alternative is to approach the

Chart 2 Device-push type of industrial system



Source : *Compiled by author*

market and enterprises in such a way as to let the product-pull system function effectively. For instance, in the digital still camera (DSC) industry, Japanese manufacturers command a share of more than 70% in terms of product brands. This indicates that Japanese makers' ability to develop and introduce superior products in rapid succession is highly regarded in the market. Although general-purpose image-processing ICs are available in the market, manufacturers of main-brand products still tend to use ICs designed by themselves. Thus, manufacturers of finished products hold strong sway over the market.

If DSCs are simply looked on as a means of recording and transferring photographs, the present technological level may be thought to have already surpassed the level requested by customers. This notwithstanding, the technological ability to develop DSCs still constitutes a source of competitive superiority because customers find values surpassing simple necessity in those products.

In this way, manufacturers can maintain the importance of optimizing individual products by manipulating customer desires and thereby curb a decline in the value of the collation/adjustment ability. In the industry where customers are ready to pay premiums for a subtle difference in product performance from previous products, the optimization of individual products continues to be as effective as ever. Such an industry does not simply accept the sacrifice of product performance for the sake of a general-purpose approach.

Nonetheless, amid a widespread tendency in the whole industry to shift from the product-pull system to the device-push system, extrication from the existing system also has to be considered an alternative. Yet the shift to the device-push system requires Japanese corporations to develop a different concept and way of thinking from what they have so far pursued. Therefore, such a shift is expected to be accompanied by great difficulty.

The problem is that concepts and the way of thinking are in themselves rooted in the constructed corporate system. The product-pull system is supported by a chain of corporations that seek to adapt themselves to the immediate customer needs. In this process, each corporation finds itself in a position subordinate to customers, and only corporations capable of responding to customers' waywardness can hope to survive.

What each corporation should do under the product-pull system is defined by downstream customers in many cases. Such corporations may be skillful in coping with challenging problems posed by customers (engineers may feel delight in doing so), but are not necessarily accustomed to presenting problems on their own and proposing them to customers. In particular, they find it difficult to advance proposals that could alter their division-of-labor relationship with customers.

Nevertheless, under the device-push system, the redefinition of products and units of functions represents an important activity that generates value added, which in turn brings about a change in division-of-labor boundaries between corporations. Moreover, the abstraction of units common to products across the board amounts in many cases to imposing the short-term sacrifice of product performance on customers. It is anything but easy to persuade "wayward" customers to accept such sacrifice.

In this way, it is difficult to cope with the device-push system since a mere change in the way of thinking does not suffice. However, if it is impossible to ignore major currents in technology and industry, Japanese corporations are faced with the need to overcome such difficulty and construct a mechanism capable of coping with both the product-pull and device-push systems. JS

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