

## Episode 21

### **Cheer Up! Nippon Semiconductors!**

This series of “Episodes of Dynamic Semiconductor Evolution” is now complete with this No. 21, the final Episode. I would like to conclude the final chapter as a song to cheer up Japanese semiconductors.

The semiconductor industry has continued to develop, realizing many dreams, despite many twists and turns throughout the 20th century.

From 1999 to 2000 the world market grew, booming with 37% growth at the end of the century, which made us feel that semiconductor would continue to grow strongly in the 21st century, too. However, in the next year, 2001, the market declined drastically by minus 32%, turning into a super-class recession.

Performance of general electrical manufacturers with the semiconductor division was disastrous. Total operating loss of major five companies (Hitachi, Toshiba, Mitsubishi, NEC, and Fujitsu) was 492 billion yen in the red, and this amount was almost the same as the total deficits of the semiconductor divisions of these companies which was 508.8 billion yen.

For this reason, each company explained to the outside that “the criminal of our company’s deficit is semiconductor division”.

I had been already retired at this time, but I heard from one semiconductor executive manager a comment as follows. “You know there was a word of “national traitor” in Japan at the time of World War II. We are now blamed with the word of “company traitor”. This major depression triggered the restructuring of the semiconductor industry in Japan, and it led to movements such as separation and consolidation in the semiconductor field.

In November 2002, NEC’s semiconductor division was separated from the mother company and was established as NEC Electronics, and in April 2003, Renesas Technology was established with merger of Hitachi and Mitsubishi’s system LSI divisions. At the same time Mitsubishi’s DRAM sector was sold to Elpida. They became independent as specialized semiconductor companies from the position as divisions in general electrical manufacturing companies such as Hitachi, Mitsubishi, and NEC. A challenge in refreshed management ways began in the new century.

Now, if we roughly divide the historical evolutions of the Japanese semiconductors that have undergone various transformations, they would be classified as “the winning period” when we grew strongly and increased share in the 70’s and 80’s, and “the lost period” when we lost the share and our momentum in the 90’s until today.

What were the causes of victory and defeat at each period? Daring with some overlaps with the contents I already described, I would like to summarize them here, again.

The causes of victory in the “winning period” (70’s - 80’s) are as follows.

- Japan’s lead in the consumer field:  
Sony’s transistor radio “TR-55” took the initial lead, and the overwhelming position was built in the products such as TV, calculators, watches, VCRs, Walkman, and others, and Japanese semiconductor makers secured the largest customers in the domestic market.
- VLSI Project:  
In this project, a clear positioning was made that “Semiconductor is the important strategic field of the country”, and equipment makers and materials suppliers in the upstream industries were cultivated and strengthened.
- Comprehensive power of major electric manufacturers:  
Abundant human resources and financial strength acted advantageously for advanced development and capital investment.
- Thorough quality control:  
Team plays centering on the QC circle activities realized excellent quality and high yield.
- Higher level of education and cooperativity:  
High level and uniformity of general education as well as the social climate that emphasized “cooperation” rather than “individuality” brought about very advantageous environment for the mass production of difficult products like high density memory products.

Next, the causes of defeat in “the lost period”, after the 1990’s, are as follows.

- Japan missed the tide of digital revolution  
Japan had high share in such products as TVs, VCRs in the “analog age”, but as it shifted to “digital age”, the semiconductor market also shifted to overseas and Japan got to the situation of almost complete defeat.
- The rise of “horizontal division business model”:  
The spread of digital trend created a business model of horizontal division, and companies that combined high expertise and low-cost capabilities appeared. The superiority of Japanese manufacturers in “vertical integration operation” faded.
- Management speed:  
Organizational structure of “a division in a large company” caused slow decision making, and they often missed the investment timing. Nothing is more important than “speed” in semiconductor business operations, and specialized manufacturers were superior in this respect.
- Delayed response to globalization:  
As domestic market was large in “winning period”, management was domestic-oriented. In addition, the weakness of the English language skills of the Japanese became a big handicap, and the response to globalization was delayed.
- Inadequate “concentration and selection”:  
Overseas semiconductor manufacturers clearly set out their respective core businesses. In Japan, there were many semiconductor manufacturers that covered wide range of product lines called “department store management”, and product focus by “selection and concentration” is still at an early and pre-matured stage.

● After-effects of “Japan-US Semiconductor Agreement”:

The domestic market share was surrendered to overseas manufacturers as the result of the execution of the agreement. Moreover, DRAM was placed under controlled trade under the agreement, and it resulted in the domination of DRAM market by Korean manufacturers.

● Lack of recognition of the importance of semiconductors:

Unfortunately, we cannot say that the importance of semiconductors is shared throughout the country in Japan. On the other hand, top leaders in the foreign countries emphasize its importance with their own initiative. In particular, since the mid-1980’s, the difference in stance between Japan and other countries was widened.

What can be said from “causes of victory” and “causes of defeat” analysis as above is that “strength” in one environment turns into “weakness” in a different environment. The principle of Charles Darwin’s theory of evolution is “survival of the fittest”, and we can say that quick response to changes in the environment is the greatest business strategy. People involved in semiconductors must always be prepared for such “dynamism of semiconductors”.

Now, in the new century, the semiconductor of our country is getting a tail wind of the “Second Digital Wave” centering on digital consumer products. The time has come for the industry, the government, and the academia to cooperate and challenge for semiconductor revival.

Table 21.1 summarizes issues and measures for government and, in the same way, Table 21.2 summarizes issues and measures for industry.

- ★ Take measures for strengthening semiconductors as the most important strategic sector  
Including refinement of infrastructure, tax incentive, nurturing human resources and ventures, and support for R&D
- ★ Revitalize semiconductor education and research activities at universities
- ★ Totally review English education methodology and improve overall capabilities
- ★ Establish semiconductor strategic planning organization consisting of leaders from industry, government, and university

Table 21.1 Issues and Measures for government

- ★ Abandon me-too approach, and focus on “selection and concentration” of business
- ★ Catch the crest of “Second Digital Wave” brought by digital consumer products
- ★ Promote and strengthen globalization of the business operation
- ★ Make strategic collaboration with upstream and downstream industry
- ★ Establish nimble process in the management decision making

Table 21.2 Issues and Measures for industry

First of all, what should be done at the level of government, either national or local level, is to position semiconductors as an important strategic field of the country, and promote it as a driving force or engine for strengthening national competitiveness. It is important for the national and local governments to cooperate with each other to create “fertile soil” for the semiconductor industry. Included are infrastructure development, tax incentives, research and development support, venture entrepreneurial environment, human resource development, and so on. At universities and national laboratories, it is the mission to focus on developing advanced technologies for semiconductors and open up new fields that can lead the world. We should say that activities of academia in Japan is sluggish compared to those in the US, Europe and Asia.

Also, at the corporate level, we have to pave the way for a new paradigm by abandoning the past experience of success. In particular, it is urgent to adapt to globalization by taking into account the changes in the global market structure.

In addition, we must adopt the merit of the horizontal structure to the traditional business of the vertical integration structure, and we have to be thorough about “selection and concentration”, with alliances and consolidations in the scope, too.

In terms of logic products, the era in which all companies could have their own production lines as IDM was over. However, relying completely on other countries for the manufacture of semiconductors is also an extremely big problem in terms of national security. Some measures are needed, including the alliance of several companies to make a shared manufacturing line of an economically feasible scale or to establish an independent foundry company.

In the product strategy, we need to make the technologies and products which fit best to the customer needs by capturing the trend of new markets.

Japan is in an advantageous position among all countries in the world, in that both upstream and downstream industries are solidly established. We should make full use of this advantage in the actual business by deeper collaboration among them.

If we overcome these challenges and take advantage of the arrival of the “Digital Second Wave” as an opportunity, it is not impossible for the semiconductor industry in Japan to bring in the days of “sun rises again”.

Based on this background, I thought of making a cheering song for Japanese semiconductors.

In May 2002, the impact of semiconductor recession was taken up largely in the papers, just before shareholders’ meetings of general electric manufacturers. As mentioned above, the tone of “the criminal of our company’s deficit is semiconductor” was expanded, and people involved in semiconductors had a deep sense of shame.

At that time, I was invited to an international conference related to semiconductors in Morocco. On the flights to and from Morocco, I was thinking if there was something I could do to cheer up our semiconductor industry, and I wrote a cheering song “Cheer up, Nippon semiconductors!” However, this did not spread as a cheering song.

The time passed, and it was March 10, 2005. I was asked to give a lecture at the forum of semiconductor engineers sponsored by Renesas Solutions. At the end of the lecture, I introduce the song of “Cheer up, Nippon Semiconductors!”

At the dinner after the lecture, this song became a topic and the opinions there were mostly that it was in “somewhat tragic atmosphere”. Then it was agreed to make both lyrics and melody brighter and uplifted tone. And Tetsuro Kitano, the president of Renesas Sales, and Kazuo Minorikawa, the president of Renesas Solutions, were to support it.

The new cheering song was completed with the title of “The Sun Rises Again for Semiconductors”. Of course, the original version is in Japanese, and the summary of the English translation is shown below.

#### “The Sun Rises Again for Semiconductors”

- (1) Semiconductors realized many dreams like a shining star  
     On the opening of the new century, attacked by the violent recession  
     Overcoming all difficulties, the door to the new history opens
- (2) Scarce resources in our country, only way is the intellect oriented nation  
     Overcoming silicon cycles, survival is our must  
     Future of our country on our shoulders, semiconductor is at the core
- (3) We won fierce battles in the past, those are memories of high honor  
     It is the time to throw away those glories, and make firm determination  
     The sun also rises for semiconductors!  
     Cheer up, Nippon semiconductors!

By the arrangement of Kitano, a composer Yusuke Yamada composed the melody, and Akira, a new rising singer and a friend of Yamada, sang it. Recording was done on April 19 of the same year,

and CD was completed in June. A total of 2,000 CDs were produced and distributed to people in the field of semiconductors.

Now I believe both lyrics and melody fit for a cheering song for semiconductors. I hope that many people will like to sing it.

Well, in April 2010, Renesas Technology and NEC Electronics merged, and started as a new company, Renesas Electronics. The sales volume of the new company is approximately 1.10 trillion yen, and it is ranked third in the world next to Intel and Samsung, and it is the largest in Japan. Especially, the market share of microcontroller is 30%, exceeding Freescale Semiconductor in the second position (10%) by far. In terms of scale of economy, it can be said that it is sufficiently competitive.

On the other hand, there are many points that we must still wait for future efforts in business development including globalization. It is the biggest walls for Japanese semiconductors and I hope that they will do their best to bet on survival.

We cannot emphasize enough the importance of semiconductors in Japan where we are aiming for an intellectual and technology nation with scarce natural resources and energy sources.

For general public, semiconductors cannot be seen or touched directly, but they are everywhere in the equipment in houses, in cars, in companies, and in schools, and hospitals, and they support the foundation of our society. The stronger the semiconductor, the stronger the various high-tech fields supported by it. Conversely, if the semiconductor weakens, the momentum of the country will be reduced like getting body blows.

I believe that the revitalization of semiconductors will be a major driving force for the future of Japan. And I hope that those involved in semiconductors open up a new era without losing the mind of "Never give up!".

Cheer up, Nippon Semiconductors!

Now I would like to finish this series of "Episodes of Dynamic Semiconductor Evolution".

Thank you for your reading this article for a long time.

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Note: The original version of this article was first published, in Japanese, on the Semiconductor Industry News (Sangyo Times Co., Ltd.) from July 12, 2006 to January 9, 2008.