

Episode 18**Proposal: “Revitalization of Japanese Semiconductors”**

One indicator of relative competitiveness in the semiconductor field is the share in the global market. Although it is not the only indicator, it is the most important indicator in capturing competitiveness as a long-term trend.

Looking at the trend of market share of Japanese semiconductors from this point of view, we can see a clear trend of declining share with the peak at 52% at the end of the 1980's, and in particular, the declining pace became very rapid since the semiconductor recession in 1996.

During the time when I was being depressed by the disposition of two-stage demotion at Hitachi, the decline of Japanese semiconductors became not just a matter of individual companies but also a critical situation for the country as a whole.

In each country of the world, the national leaders were at the forefront promoting the competitiveness of semiconductor industry. Also in Japan, it was argued that some big measures should be taken, with SIRIJ (Semiconductor Industry Research Institute Japan) as the center of the studies.

In such circumstances, Masanobu Oyama (then Executive Vice President of Toshiba), who was the head of SIRIJ, consulted with me in early March 1999. It was a request to me to carry some role to contribute to the revitalization of Japanese semiconductor industry. I also got words from him, probably with some flattery, saying “It is our consensus that Makimoto-san, as a person who successfully concluded Japan-US semiconductor Agreement negotiation, is the only person who can carry this important role.”

Between Oyama and me, we crossed swords together against SIA at the Vancouver negotiations of Semiconductor Agreement, and we were war buddies, so to speak.

Although it was like gathering chestnuts from a fire, I felt it was a new mandate from Heaven to me, when I was kept away from Hitachi's semiconductor business. I decided to take on this big role with the feeling that “I will try my best for the restoration of semiconductors of Japan.”

The first meeting was held on March 17th of 1999. The mission of this committee was to summarize the proposal over a year for the revitalization of the Japanese semiconductors.

The first thing we did was to name the committee “Semiconductor in New Century Committee”, SNCC as its abbreviation. Yoichi Unno of Toshiba took the seat of head of the secretariat, and the representatives from major semiconductor companies and consortia became the members. The members were; Akihiko Morino of NEC, Seiji Kubo of Hitachi (later replaced by Toshiaki Masuhara), Tetsuo Nakamura of Fujitsu, Jun Ueda of Oki, Toyoki Takemoto of STARC, Masahiro Iiri of Selete, Akihiko Ishiya of ASET, and Taro Okabe of SIRIJ.

We started to make a future scenario of the Japanese semiconductors among these 10 members. The SNCC meetings were held twice a month, and I attended these meetings with the highest priority. At the outset, emphasis was placed on the analysis of current situation on competitiveness,

investigation of the trends of market and technology, and semiconductor strategies in other countries.

As a part of that, we visited IMEC in Belgium, Alba Center in Scotland (Design Center of System LSI), Telecom Valley in France on 15th through 23rd of May of this year, for the purpose of surveying the semiconductor strengthening measures in Europe. This European inspection tour gave us very important suggestions in formulating the SNCC recommendations.

Based on numerous discussions, hearings, on-site inspections, etc., the final draft of SNCC was summarized on January 20th, 2000.

At the beginning of the proposal we wrote a sentence as follows:

“In considering the background of the rapid decline of the competitiveness of Japanese semiconductor industry, SNCC began its activities in March 1999 to suggest rebuilding measures. With the cooperation of many people, we deliver this as the final report. Based on this, we hope that prompt actions will be taken to rebuild the semiconductor industry.

- a middle part omitted -

When considering that semiconductors are the foundation of every high-tech industry, we must recognize that Japan’s current situation is in a critical stage. Under such background, SNCC recommends measures to promote strong collaboration among industry, government and academia.”

The key points of the Proposal are summarized in the following three points.

Analysis of current situation

Since the 1990’s, the market shares of Japanese semiconductor device manufacturers as well as semiconductor equipment manufacturers have been declining, and the future of high-tech fields is in a critical threat.

Even in research and development activities leading to future trends, the number of papers in major academic conferences is decreasing, indicating that academia activities such as universities and national laboratories are also weakened. For example, at the ISSCC (International Solid State Circuits Conference) in 2000, there were only four papers from the Japanese academia, largely lagging behind the United States (29 papers), Europe (13), and Asia (7).

Since the semiconductors are the technological base for all high-tech industries, strengthening semiconductors is a very important matter for the future of the whole country.

Overseas situation

In the foreign countries, since the 1980’s, the semiconductor field has been regarded as an important strategic field for the country, and strengthening measures have been promoted through collaboration among industry, government, and academia.

SEMATECH (Semiconductor Manufacturing Technology) in the US, IMEC (Interuniversity Microelectronics Center), Alba Center (LSI Design Center) in Europe, ITRI / ERSO (Electronics Research and Service Organization) in Taiwan, KAIST (Korea Advanced Institute of Science and Technology), and IME (Institute of Microelectronics) in Singapore are all playing important roles and contributing to strengthening semiconductor competitiveness in each country and region.

Proposed measures

We propose measures to build the world leading technology base in SoC which is the core of the digital consumer and information field. For that purpose, we should establish SoC Design Research Center and SoC Device and Process Research Center.

In the former, we focus on building a new IP based design methodology, and on fostering SoC design engineers.

In the latter, we open a most advanced joint wafer processing line, and promote the development by the collaboration of device manufacturers, equipment manufacturers, universities and research institutes. The purpose is to acquire the world's most advanced position in device and process technologies beyond 100 nm.

Furthermore, we should establish "Semiconductor Cooperative Development Organization" in order to make a national strategic plan for semiconductors, and coordinate cooperative development by industry, government and academia.

Fig. 18.1 shows the outline of the SNCC Proposal.

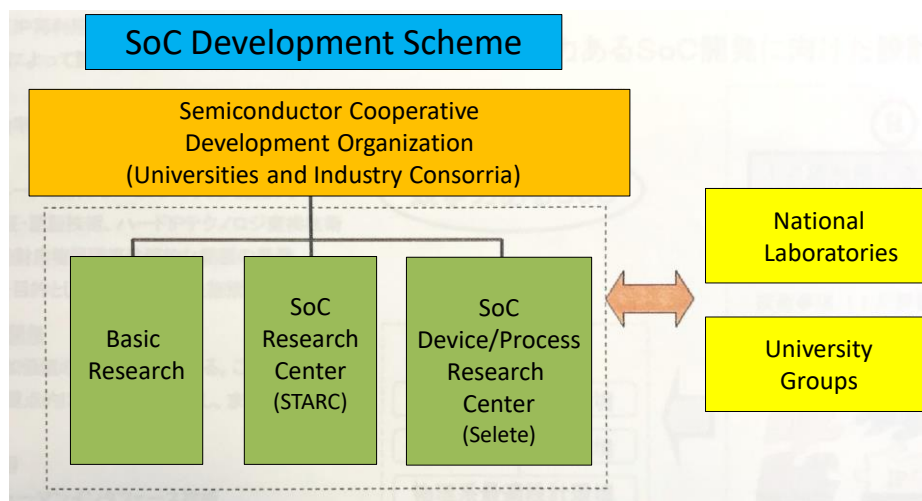


Fig. 18.1 Outline of the SNCC Proposal

Based on this final plan, the Advisory Committee was held on February 17 of the same year in order to further expand the discussion. We asked Shoji Tanaka, Professor Emeritus of the University of Tokyo, to chair the committee, and also experts at the universities and the industry to join. We got valuable advices from this Advisory Committee, and they were reflected in the final version of the recommendation.

Through this process, "Proposal: Revitalization of Japanese Semiconductors" was reported from SNCC at the SIRIJ Management Board held on February 23, and it was unanimously approved. The party to celebrate the successful completion of SNCC project was held on April 20th, and the one-year activity was closed.

The next phase shifted to the execution stage.

The "Asuka" project was started as the joint development project at EIAJ (now JEITA) in response to this SNCC recommendation. The joint development of process and device technology (65 nm)

and design technology for the next-generation system LSI started in April 2001 as the five-year plan.

“Selete” was to take charge of device and process technology, and “STARC” in charge of design technology.

In July 2001, “Semiconductor MIRAI Project” was started in a 7-year plan in the METI’s (Ministry of Economy, Trade and Industry) “Programs of Fundamental Technologies for Next Generation Processes and Devices”.

The MIRAI project was targeting at the future generation technology (45nm) beyond the ASUKA project technology, and it was to cover basic technologies such as development of gate films and wiring materials, new transistor structure, and so on.

For the research and development of such advanced technologies, “Tsukuba Super Clean Room” was completed in Tsukuba Science City, and it has been playing a core role in the semiconductor advanced technology research.

If it is asked whether the competitiveness of Japan’s semiconductor has been strengthened by these consortium activities so far, unfortunately, it has not yet reached the situation that can be clearly said “yes”.

Although we achieved the goals initially aimed at each project, the enhancement of overall competitiveness has not been realized.

Problems such as insufficient “speed” of operation and segmented organization due to consensus-based project management of participating companies have been pointed out. A new regime was launched in April 2006, including measures to deal with such things. The activities of Selete and MIRAI are managed in a unified manner under the “Tsukuba Semiconductor Consortium” and more efficient research and development are pursued.

In order to further revitalize such industry activities in Japan, it is indispensable to make it widely recognized as to the importance of semiconductors throughout the country and to establish national consensus. In this respect, the recognition level in Japan is much lower than that of Europe, the United States, and other Asian countries. The semiconductor industry in Japan must focus on further efforts to build a national consensus about its importance. If we can unite all the power of the country based on such a consensus, the revitalization of the Japanese semiconductor is never be impossible.

The one year when I hosted the project as the chairman of SNCC was a valuable period for me to think about the future of Japanese semiconductors day after day. Perhaps it would not have been possible for me, if I had not been in the depressed situation by the demotion.

The copy of “Proposal: Revitalization of Japanese Semiconductors” at hand (Photo 18.1) is a memorable life time treasure for me that I can never forget.



Photo 18.1 “Proposal: Revitalization of Japanese Semiconductors”

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.