Oral History of Tsuyoshi Kawanishi

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Recorded: December 12, 2014
Tokyo, Japan

CHM Reference number: X7369.2015

Stanley Myers: Today is the 11th of December, 2014. And I'm here to visit with Kawanishi-san. So a brief background on Kawanishi-san. I'm Stan Myers and have known him for a number of years. And I'll give you some background on Kawanishi-san. Kawanishi-san was born on February 19th in 1929, as fourth boy of his father and mother. Kawanishi-san relocated five times during his elementary school days. During the tough period of the World War II, 1941 to 1945, he went to Tokyo Municipal First Junior High School. He entered the Naval Accounting School in 1945 for four months until the end of the War. The experience in the Naval Accounting School strengthened his body and his mind. Later he went to senior high school from 1946 to '49. He was the top student of the school for three years in a row and received the Imperial Award for his score. Kawanishi-san established the Table Tennis Club at the school as its first captain. He entered faculty electrical engineering at Tokyo Institute of Technology in 1949, and received his Bachelor of Science degree in Electrical Engineering with graduation thesis in Electrical Waves Antenna in 1952. Professional background, Kawanishi-san joined Toshiba in 1952 following his school. And was engaged in the Vacuum Receiving Tube Division of the company. He started his career in semiconductors as a member of the inaugural Business Group in Semiconductor when Toshiba established the first prototype Manufacturing Division for Semiconductor Devices in January of 1957. The experience had great influence on his life career. He led Toshiba's semiconductor business through the manufacturing position, including General Manager of Toshiba's Oita Factory, starting in April of '77. Then Group Executive Semiconductor Group starting in June of 1984, and Corporate Executive Vice President of Toshiba from June 1990 to June 1994. Kawanishi-san served as a Senior Advisor to Toshiba from 1994 to 1999, then as Emeritus Director from '99 through 2009. Through 47 years of his career at Toshiba, he made semiconductors his life work. I think I'll stop there. I'm going to put the rest in writing, okay? They can dub that out. And so we can get on to the question/answer and you telling us. Okay, Kawanishi-san, I'd like to start with your early years, your family background, then your early professional years, and what were the key semiconductor-related projects that you were involved in. And as you go through that, when you want to break, take a break and get a drink or whatever, and we'll finish up with you kind of giving advice to the young people coming out of school.

Tsuyoshi Kawanishi: Okay. Firstly, I'd like to talk about my father and mother.

Myers: Okay.

Kawanishi: My father was born in a very poor farmer's house in Kobe. He received the scholarship by a softball team, came up to Tokyo, and graduated from the University of Tokyo, at the top of the school, at the top of class. After that, he was employed by the Department of the Interior of Japanese Government. His first job was to create the health insurance system in Japan. We are proud that he created that. Later, he was assigned to serve Prefecture Governors for three prefectures including Nagasaki, Kyoto, and Tokyo. His final job was for Japan Red Cross Society as president. He passed away in 1978 at 88-years-old. So I should say he's a hero of success story. On the contrary, my mother was born in Mitani Family, a wealthy family. Her oldest brother was very famous philosopher, Takamasa Mitani. Her second oldest brother was Takanobu Mitani, former Ambassador to France, and also Grand Chamberlain under Showa Emperor. Her sister was the founder of Tokyo Women's High School. Anyway, brilliant family. However all of sudden a tragedy hit her. She lost her oldest son when he was a student of the University of Tokyo. It's a big shock to her. She, I would say, was crushed with big grief. At that time, the President of the

University of Tokyo, Prof. Yanagihara guided her to Christianity. My mother became Christian and spent her whole life for Christianity. She preached the bible until 95-years-old. She passed away at 101-years-old. So I should say, I was very fortunate to have great mother and father.

Myers: A very good foundation.

Kawanishi: Yeah, thank you. And during the primary school, you explained already, I changed school five times. For middle school days, it was during the War, so I have very few memories about this period. I belonged to the Naval Accounting School only for four months, however, I have a lot of memories there, because I trained my body, mind, and health during such a short period. Since I belonged to Navy, I was not allowed to go to national high school. Therefore I entered a private high school, Gakushuin High School. Three-year high school period was a brilliant time for me. I kept the top of the class throughout all three years, and I received the award from Japanese Emperor, with memorial watch. I also established the Table Tennis Club at high school. I participated in table tennis tournament of Japanese High School Interscholastic Athletic Competition as representatives from Tokyo. So I was pretty well. I established the Bible Class Society too. Anyway, these three years I had good young days. After high school, I entered into the Tokyo Institute of Technology where I diligently studied a lot since I wanted to be an excellent engineer. At that time I lost my oldest brother who was majored in physics at the University of Tokyo and passed away from sickness during his college period. I wanted to make his dream to come true for him too. Toward the end of University days, I got known a company, Sony. At that time the company was called as “Totsuko”. I had an internship training at Totsuko. I wondered if I should enter into Sony or Toshiba? Finally I joined Toshiba. Because at that time Sony was a very small company, and Toshiba was a big company already. I decided to go to Toshiba. I majored in radio engineering at the university and I wanted to belong to the related division in Toshiba. But, I was assigned to Toshiba’s manufacturing division. It was a big shock for me, because it was completely different from what I wished. However, this would result in giving me a big fortune later, which I did not think at all at that time. When I graduated from the university, I didn't know anything about the society. Throughout several years working with workers, I learned many things. Especially I realized the importance of manufacturing and the importance of the communication with others. Most fortunate thing is, that I had a chance to join the semiconductor business since Toshiba started in 1956. I was elected as the first engineer in semiconductor business from the Receiving Tube Division. It was a big fortune. When I was a student, the knowledge about the semiconductor was very poor, very immature. Why I joined the semiconductor. So this encounter to the semiconductor is not my intention-- my wish. Maybe heaven's voice. Because I didn't know semiconductor, but fortunately, I joined the semiconductor business and now still I'm working for semiconductor until 86-years-old. Semiconductor is my life work.

Myers: Right. I was just going to say moving into some more details of your professional years as leading Toshiba.

Kawanishi: Okay. Before that, I would like to mention about the infancy era of semiconductor in Toshiba. At that time around 1957 to 1964, we worked very hard. Over time work was probably about 150 hours per month. Every morning I read the books, industry books, only ones that we have. I read books with our friends. This helped me to dedicate myself to the semiconductor. About 1960, I fortunately had a chance to visit United States. Japan was defeated country from World War II, but at that time American

people were very, very kind to a young engineer like me. I learned many things from them. Many years later, it occurred the so-called trade friction issues between the two countries.

Myers: Right.

Kawanishi: At that time, I was a representative of Japanese side, but I didn't forget that I learned semiconductor from United States. So I could say, "United States is my teacher of semiconductor." This is my infancy era in Toshiba.

During a period of growth, it's defined from 1965 through 1981. I was assigned to the manager of Manufacturing Division. At that time semiconductor industry was very, very labor intensive. Under me there were 1,000 employees, workers including two-shift, three-shift and so on. I learned the importance on how to organize, how to harmonize, and how to make the target of them to one target. It's pretty difficult, because 1,000 people for a single division. But this was a very helpful for me when later I promoted to Division Manager, Plant Manager and Manager of Group. This experience was very, very useful. At Oita Works in Kyushu Islands, I was assigned to Plant Manager of the entire Oita Works around 1977. This time it was the first time to leave my family. It was during Oil Shock. That means economy was extremely bad. But several months later the economy came back. We installed a lot of advanced equipment, modern equipment, automated equipment, high class clean room, automatic bonders, testers, and others. Oita Works became one of the most advanced semiconductor factory in the world. And many business came. And big profit we could get. So my experience as General Manager at Oita Works was a brilliant three-year for me. At that time Japanese semiconductor was based on manufacturing. So the factory is a treasure. The factory is still there, which meant we are proud of that.

Another important decision was starting of CMOS technology. Toshiba was a little bit behind from our competitors regarding NMOS. So we selected CMOS as a target. This is a very big decision, because CMOS is pretty difficult technology, and requires very complicated manufacturing. But we all decided to compete with this product, and later CMOS became a weapon for Toshiba LSI.

Myers: Would you say that was your biggest project and challenge that conversion from NMOS to CMOS?

Kawanishi: Yes, I should say later. But this time, I was Plant Manager, and Plant Management of Division made a big decision, not just myself. But it's a very good big decision for Toshiba later on. We had an advantage in CMOS technology. This is so-called growing up days.

And I like to talk about the top of semiconductor. It's a 1981 to 1994. I was assigned to top management of semiconductor business in 1981, because my predecessor passed away suddenly and I had to succeed that. At that time, the circumstance of semiconductor, Toshiba semiconductor, was very tough. So the President, Mr. Saba, and Senior Vice President Nishijima established big project, “Double “W” project”. Double comes from “Win at Worldwide”. As a top management of Toshiba’s semiconductor business, we focused on how to recover, how to catch up the top level of semiconductor not only in Japan, but also in the world. President Saba and the Senior Vice President Nishijima invested for Semiconductor Group three times over the past-- through the three years, and doubled the number of the

engineers for semiconductor business through the three years. So this was a very unique project, because Toshiba is so-called heavy industrial company, or consumer electric company. The aggressive investment into semiconductor business was a very unique and different strategy considering about the conventional Toshiba thinking. Fortunately we could achieve the result of this project. This led our later successful moment with DRAM, big success story we had.

Toshiba is a so-called integrated company. I would like to emphasize the strength of integrated company like Toshiba. Integrated companies sometime lose the clear target, or clear vision because the companies have multiple businesses. But for Toshiba Double “W” project was an entire company's project. So every strength of the company was concentrated on semiconductor. That was a very, very strong, because the strength of many aspects are brought together and concentrated into one goal of the company. I would say that this project, as an eternal project is a historic moment in Toshiba's history, I believe.

Second thing, DRAM. At that time, the DRAM was the symbol of semiconductor.

Myers: Right.

Kawanishi: Every company concentrated DRAM business. But Toshiba, regarding 64kDRAM-256kDRAM, was far behind our competitors, Hitachi, NEC. We concentrated-- we targeted one megabyte DRAM. We introduced my favorite process technology, CMOS. We selected planar technology for construction of a capacitor. The benefit of planar technology was that the existing equipment could be used right away for mass production. This brought a big advantage for us. We did the ramping up of DRAM production more than half a year ahead the competitors. In 1988, we achieved the profit from semiconductor business up around 70 percent of total Toshiba’s profit. And this year Toshiba marked number one semiconductor production. I would like to emphasize that the key factor of success of semiconductor business is differentiation. But most important thing is that the differentiation, or the technology should be matched to the requirement of the market.

Third project is internationalization. As you know, semiconductor, looking at the customer, looking at the vendor, looking at manufacturing place, or looking at the equipment engineering, everything should be international. And when I was at the top of Toshiba’s semiconductor business, internationalization was one of the very important things. And after that, when I promoted to Senior Vice President of the entire Toshiba, I was also responsible for Toshiba's internationalization. I thought there are three important things regarding the internationalization. One is so-called logic, logical aspect. Logical aspect is shown by the figures such as imbalance of trade, or local content. Second aspect is interests. We can get the money or lose by the internationalization. Third aspect is emotional. These three is very important in internationalization, I recognized. To overcome these three aspects, I decided to use three ways. One is we have to have world-class our own core technology. This is a very important thing. Second is to exploit the relative advantage of each region. Third is, to forge relationship with good overseas partners. The good results of this concept -- examples are our collaboration with Siemens, German company, collaboration with Motorola, collaboration with LSI Logic, and assembly manufacturing factory in Asia. Of course, I have a lot of disadvantage cases. I should say competition comes first, and the cooperation, second. The alliance should be considered as “multiplication”, not “addition”. Let me explain about that. If

A-company has 70 percent level in world-class, and B-company also 70 percent world-class level. In case of addition, 70 plus 70 percent is 1.4. But multiplication 70 by 70 comes to 50. So each company which you want to collaboration, should have more than 100 percent power world-class. So this is very, very important. In the case of Motorola, they are very strong in memory. They are very strong in microprocessor. And I felt also technical age can be more important than political friends. Because when we collaborated with Motorola, unfortunately, we have suffered from the so-called Toshiba Machine-COCOM – violations issue. Our Chairman and President resigned at the same time. It was a very sad matter in Japan. But at that time, Motorola dealt with Toshiba very kindly. Motorola usually used to be very tough to Japan, but at that time, Motorola covered Toshiba with this collaboration.

Myers: Great.

Kawanishi: This is a project when I was in Toshiba. Go ahead?

Myers: Yes. Let's move on to say, certainly, you mentioned, do you have any one particular key semiconductor-related project that you just remember all the time that you were proud of? And maybe-- you mentioned a number of projects, but is there any one that comes out as premier. Why did your company and Japan choose semiconductors? Now thinking more broadly. You chose semiconductors because you personally thought this was great, but why did all of Japan walk into semiconductors?

Kawanishi: Total Japan or Toshiba?

Myers: Yes, Total Japan.

Kawanishi: Of course, all the time semiconductor is leading industry worldwide base.

Myers: :The growth potential…

Kawanishi: Should follow-- Japan should follow that. So for every company it was a big target how to produce a semiconductor by themselves.

Myers: So the major reason for success in Japan was that everybody just understood the future and went for it?

Kawanishi: Perhaps, there are other factors at that time. One is that Japan's competitors were only United States or Europe at that time. So from a labor perspective, Japan had some advantage about that. In addition, in Japan, we have already had a very strong electric market. For example, desk calculator, watch, television, other consumer products. So we have our market ourselves in Japan. So we could follow our customers' voice. It is very, very important that we create new devices to be adapted to the systems. The third thing, compared to United States or compared to Europe, our labor costs, or the cost infrastructure was pretty better. And the currency rate at that time was not so bad. So so-called infrastructure, I think, was pretty good for Japan. And we had the very hungry spirit to catch up United States which put the thinking, among all Japanese companies, all industry people, to very, very positive about semiconductor.

Myers: Well, I used to hear there was a famous American that tried to work quality in the US, Mr. Deming.

Kawanishi: Yes!

Myers: And he came, and US ignored him, and he came to Japan. <laughter>

Kawanishi: I was very deeply involved, yeah, in quality control. As I mentioned, the another important thing is, we are very strong in manufacturing technology and the quality control technology. And fortunately, the highlighted products of semiconductor at that time, memories and discrete devices fully utilized the excellent manufacturing technologies and quality control technologies for mass production as you mentioned.

Myers: Yeah, I think he had a significant impact. I'm not sure that was the only thing that made Japan become very strong competitively, but certainly he had an impact, I think.

Kawanishi: Right.

Myers: More than he did in the US. We didn't listen to him enough.

Kawanishi: We have another way.

Myers: Right.

Kawanishi: One of the example is "The Brain of Israel" which I wrote. I visited Israel several times. I had a big interest about technologies of Israel. I was not interested about their religion or others, but-- <laughter>. Yeah, very interest I have in their technology skills.

Myers: Yeah.

Kawanishi: I wrote a book about the technology of Israel. It was --at that time, not well-known. So this is many-- we can sell-- I could sell many books about this.

Myers: But Israel, you were right on target on that. And it's amazing that people don't realize the depth of technology in Israel.

Kawanishi: Yes, yes.

Myers: It's unbelievable.

Kawanishi: Unbelievable. Yes. I still have some connection with Israel in Tokyo. But I don't want to go to Israel currently. <laughs>

Myers: You have them come here. <laughter> Yeah.

Myers: In the end, let's talk a little bit about how you see the Japanese semiconductor industry in the future. What's your recommendation to young Japanese people if they want to become a lawyer or a doctor or something? Or how do you influence them to get into this industry?

Kawanishi: Yes, that's a very important thing for old boy of semiconductor. It is said that some Japanese companies throw away the semiconductor business outside of the companies. Toshiba keeps theirs. <laughs> So there are several important things in semiconductor-- Japanese semiconductor industry. One is, of course, leading edge technology. And but we should think about the unique and targeted products. I'm thinking about the Magnetic RAM. MRAM has potentiality of mass production in the future, I think. But I am too old, so I cannot create that. Second point is energy. In Japan, energy issue is one of the biggest problem-- issues to be discussed. There are three parts. One is to create energy; second is to storage energy; and third is, to save energy. Regarding energy creating, which means emerging energy system, this summer I installed photocell assistance to solar energy at my home. I want to have my own experience for new energy issue and I am implementing that at my home. I recognized there are several problems to equipment. I would say that the cost for renewal energy is very high, and to sell the power to the electric power companies is not reasonable. Anyway. A lot of problem to be solved to enhance the photocell energy, renewal energy.

Myers: Hm.

Kawanishi: But in some days, semiconductor can deal with that.

Myers: Oh, absolutely.

Kawanishi: And storage energy, now we are using lithium ion batteries. But we're expecting some new idea to come. Save energy. Yes, this is the place semiconductor can contribute. One example, yesterday, Japanese, three people received the Nobel prize in LED. So the energy field is Japan's most important and strong field. We should expect some contribution by semiconductor. And the third item for the future strength for Japan is environment field on the life science. Some American companies are producing equipment for semiconductor. Cryo-pump to freeze the temperature of minus 40 degree, or even below. They are selling to semiconductor equipment companies. But always their customers say "Cheaper, cheaper, cheaper." So he changed his target customers to hospital. Hospital never says, "Cheap, cheap, cheap." But of course, the numbers of order is basically, one or two or three, not many, but very profitable. So anyway, life science is very important for Toshiba, and overall Japan. So is for equipment. And devices also find the potentiality for life science, of course, environment. The fourth thing, we have to do is to go to the rapidly developing countries, like China, India, and Vietnam. We are a little bit behind marketing to those areas. So there are many things.

Myers: So if you were a young student entering a university today, what would you-- what would be your driving force to go into semiconductors, or the related semiconductors, which is anything inside or outside the three to five elements?

Kawanishi: If, thinking back my history, I think there are three important things. One is not to hurry to decide your target. For the advanced technologies like semiconductor, the innovation goes very quickly.

And there are many things, wider things, deeper things which students do not know or are not aware of. So students should study many things not only related semiconductor, but also to other industries in many aspects. These many things would help him to define a vision. So first thing, don't hurry to decide the target. Second thing, most important thing is to learn the basic matters. And essential matters, essence. Don't start from the application. Our life is limited. So you need to utilize the lessons learned from the achievement in the past at first. Then he or she should make his or her own way after studying the base and essence. Third thing, find excellent teachers and/or the respectful friends. They would be very helpful and supportive later in your life. These three.

Myers: Okay, I'm going to have one final question for you, and if anything comes up during your thinking of that, let's get it on tape, so we have your thoughts. But what do you think the most exciting opportunities are in quote "technology"?

Kawanishi: In the future.

Myers: What's the most exciting thing in your mind today?

Kawanishi: Technology is-- all technology? Or semiconductor?

Myers: Well, just in your mind, what's the most exciting thing you see?

Kawanishi: Oh, I cannot concentrate on just one thing, but I think one important thing, the energy issues. What is the future energy? This is very, very important thing. Semiconductor can contribute or not, I don't know. But anyway, energy, we cannot neglect this issue, since there are many relative issues to energy. We should find the real energy.

Myers: Right. Well, I'm thinking also biomedical.

Kawanishi: Biomedical, oh!

Myers: Now that's an application for a lot of technology, including semiconductor.

Kawanishi: Yeah, okay.

Myers: So I don't know what one's the key ones, but there's always some exciting thing that relates to all base technologies.

Kawanishi: Well another thing is memory. Future memory. Because the data to memorize continues to increase.

Myers: Right.

Kawanishi: Will never decrease. That means we need more memories, memories, memories. So we have to think about the new type of memory.

Myers: One thing that intrigues me personally is the application of sapphire, which could be in a semiconductor realm.

Kawanishi: Oh, yeah.

Myers: But it's application in joint replacements in the body, you know, the body rejects titanium metal and over time you replace a hip, and you have to do it again. But sapphire's being used now in joint replacements. So I think there's just a broad array of applications of technology. I think.

Kawanishi: You are studying now?

Myers: No, well, I'm reading about it. <laughter> I'm asking you, okay, if you have any ideas on that might be good.

Kawanishi: I have many ideas, but sorry, I am too old for this.

Myers: <laughs> Well, thank you very much, Kawanishi-san.

Kawanishi: Okay.

Myers: It's always a pleasure to see you, and listen to you, and I do-- I'm glad we brought in the books you've written, it's very important to everybody that reads the history at the Computer History Museum. So thank you very much!

Kawanishi: I have been honored to join your project.

Myers: Thank you very much.

END OF INTERVIEW

