SPACE JAPAN BOOK REVIEW

From a satcom researcher point of view

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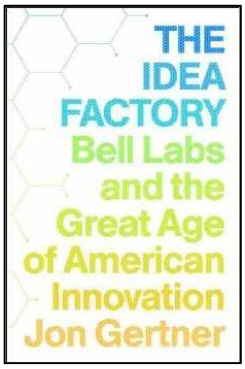

http://www.amazon.com/

Jon Gertner: “The Idea Factory Bell Labs and the Great Age of American Innovation”, Penguin Press, 2012.

Needless to say, this book is suitable for the book review column of Space Japan Review, because the Bell Laboratories, AT&T, developed the world's first communications satellite in early 1960s. I began to read this book first putting the RAND Corporation in mind that is the research institute which gathered many American geniuses, as I reviewed before [1]. But the current topic of RIKEN* crossed to my head from the middle. The author of this book, Jon Gertner, was brought up at near Murray Hill, New Jersey, where Bell Laboratories set up a base. After he graduated from Cornell University, he was in charge of articles of business, society and economy as a reporter of a New York Times Magazine from 2004 to 2011. Soon after this book was released, it got high evaluation in a book review of American major newspapers and magazines.

The Bell Laboratories was founded as the technical research institute in 1925 to push forward construction of an American telephone network. At that time, it aimed a clear subject to construct the system that can talk in any where, at any time and with anybody in the world. Therefore it recruited many excellent scientists as well as engineers. Under the management thought that encouraged for researchers of each field to exchange information positively, the building was famous for having a long corridor to force the staff to pass each other. The building of RAND Corporation has been constructed in similar thought in this point.

It was important that the federal antitrust law was not intended by the Willis Graham Act of 1921 in the telephone industry. The fund inflow of Bell Laboratories was stable and abundant by the telephone charges which was paid to AT&T as a monopoly business body every month by this law. So the studies that foresaw ahead for dozens of years had been possible in a free atmosphere. At the same time, the contribution of Marvin Kelly who is a prominent study manager was big. In addition, the study of Bell Laboratories was always activated, because there was always the problem of technology and logic that troubled telephone engineers for construction of a telephone network, and because innovative solution was demanded. In other words, the new invention of Bell Laboratories always came out of clear needs. Furthermore, the Bell Laboratories need not to worry about whether their results were used in because they were used by a monopoly business entirely.

Under such a system, research and development of a transistor was performed to aim at a solid state amplifier as future repeater device. It brought an invention of a point contact type transistor in 1947, and soon it further brought an invention of a junction type transistor by Bill Shockley (winning 1956 Nobel Prize). In addition, "A Mathematical Theory of Communication" called a shocking theory by Claude Shannon (winning 1985 Kyoto Prize) in 1947 was announced, and it was a pioneer of information theory. "Listen to the person who wrote a book." is said well in Bell Laboratories. Actually if walking at a corridor, it was said to be able to meet a person who wrote the most authoritative book in each field – Bill Shockley for semiconductor, John Tukey for statistics and Claude Shannon for information theory.

It was necessary to persuade the government that AT&T's scientific study met public profit in order to maintain the monopoly system with such a brilliant result. The posture that is going to monopolize a transistor having very high value in one company may make the regulation authorities to doubt publicity of AT&T and may be a chance to review the monopoly system. By "Consent Decision" of 1956, AT&T was to be able to maintain a monopoly under regulation in telephone service. However, instead of it, an entry to a computer market was prohibited. In addition, a patent acquiring in the past and the future were obliged to open to the public gratuitously and cheaply, respectively. It was expected that development except Bell Laboratories was promoted by the latter in particular.

The argument of the monopoly system stopped at the time of World War II suddenly. Bell Laboratories did big contribution for a wartime study of a radar as a representative and showed that it was indispensable existence in an American military campaign. An expense of 1.5 times of atomic bomb development had been spent to development of a radar.

Developments such as a silicon transistor, a solar battery, a microwave network, Atlantic crossing submarine cable (TAT-1), UNIX, CCD, and a communications satellite were performed afterwards. Development of a communications satellite is proposed by John Pierce (winning 1985 Japan Prize) [2]. A passive satellite of Echo succeeded in its experiment in 1960 and an active satellite of Telstar succeeded in Atlantic crossing television broadcast with the world's first in 1962. However, from apprehensions to greed and enormity of AT&T, Kennedy administration and the U.S. Congress got shut out the private sector completely from the international space business. A communication company COMSAT of the government authorization was established by Communications Satellite Act of 1962, and AT&T was shut out of international satellite communications business substantially.

Bell Laboratories developed a picture phone, an electronic switchboard (ESS 1), a wave guide transmission of millimeter wave. But, dark clouds were born afterwards from this time. A incorrect decision such as a hard fight of the picture phone business that nobody doubted its success had begun to stand out. On and after 1970's, the new

* RIKEN is Japan's largest comprehensive research institution. Paper fraud problem has become a hot topic recently.

company which used public technology of Bell Laboratories appeared as a rival, and it was gone ahead of competition other companies by the development of integrated circuit, laser and optical fiber. The Department of Justice appealed for a monopoly of parent company AT&T, too. It is because a thought to be competition freer than strict industrial regulation by a federal government that it meets profit of an American consumer. Company MCI which sponsored a long-distance call cheaply by a microwave network appeared. AT&T insisted on unfairness of the MCI that it applied a cheap rate because it was not responsible for universal service and used the cheap machinery whose length of life is not 40 years. However, in 1982, AT&T agreed to divide regional Bell operating company after all and to make it an independent company each. Instead of it, AT&T was liberated from an agreement of 1956 to prohibit an entry to the other industries. AT&T became to enter into market freely for data handling, communication between computers, sale of a telephone and a computer terminal that were prohibited conventionally.

A system with technically unified compatibility is necessary for transmitting an analog voice signal in a telephone network. Therefore it was assumed that a monopoly has been justified, because it was rational that a single company took responsibility for the system. However, Shannon's theory that every message can be considered as information and it can be signalized showed the possibility that a monopoly was over. The theory of Shannon gave the mathematical ground of the bell system dismantling, and the invention of Shockley became a technical ground of dismantling. The greatest success of a company sometimes becomes a cause of the decline, when looks back later. I think this is almost the same as that Takeshi Umehara said in his book [3]: "I think always that a person may fail by the same cause as putting him success".

A lot of arguments are performed about what is innovation by the latter half of this book. Innovation in Bell Laboratories is said as having moved to Silicon Valley. However, an innovation model of Silicon Valley is completely different from one of Bell Laboratories. Silicon Valley is "a collection of shipping point of an idea", while Bell Laboratories was "idea factory". Splendor of Bell Laboratories brought about a new basic idea, and was ability that an enormous technical group brought up such an idea into a product. Because Silicon Valley depends on a fund of an investor, it tends to avoid investment to unprecedented fundamental researches, and the investor said not to intend to invest scientific experiment, and new knowledge seems to be hard to be born.

Bell Laboratories moved in Bellcore and a study section of Lucent after the AT&T was divided, and it is said that former Bell Laboratories already became extinct. The author of this book gives a Howard Hughes Medical Institute and renewable energy-related innovation hub plan as the second Bell Laboratories, but they are still small and there is not yet the force as Bell Laboratories.

This book gives a lot of people related to Bell Laboratories and includes much description of a person image from breeding. So it can be read with interest. However, about discovery of background noise by Karl Jansky, this book only describes that he contributed to radio astronomy, but his discovery did not lead to development of communication method and related equipment. It does not refer to Nobel Prize related later.

Finally, I described earlier a problem of RIKEN in my mind. This is why there describes about an experiment notebook in Bell Laboratories in 1930's, and its management method is at all the same as current news report. Furthermore, I read the latter half of this book in relation to management of Communications Research Lab. where I belonged to at the age of my incumbent job. Result of Bell Laboratories in particular had the fact that it was of practical use immediately by a monopoly reason. On the other hand, I noticed that a study environment that entrusts to private enterprise how to apply a study result of an independent administrative institution of our country is not the best. In addition, next four items are given as a universal method among success factors of Bell Laboratories and gives us a good suggestion for the future study management.

- Managers including management top must be familiar with technology.
- Researchers are not responsible for raising a fund.
- Study about a theme and a system ought to be continued for many years.
- Researchers are not blamed even if a certain study is ceased.

Furthermore, creative environment that promotes interchange of ideas is more effective than competitive environment for a study.

The review article of this book in the Nikkei Shimbun newspaper on August 4, 2013 [4] is helpful.

References

[1] Takashi Iida: "Space Japan Book Review—From a satcom researcher point of view: Alex Abella: 'Soldiers of Reason: The RAND Corporation and the Rise of the American Empire', Houghton Mifflin Harcourt, 2008'", Space Japan Review, No.71, Dec./Jan. 2011/2012, http://satcom.jp/English/e-71/sjrbookreviewe.pdf

[2] http://news.stanford.edu/news/2002/april10/pierceobit-410.html

[3] Takeshi Umehara: "Horyuji theory - cross hidden", Shinchosha Pub., 1972 (in Japanese).

[4] "Ruling the world technology The rise and fall of the Bell Laboratories Author: Jon Gertner Real image of scientists full of personality", Nikkei Shimbun Newspaper, Aug. 4, 2013 (in Japanese).