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Erik Brynjolfsson and Andrew McAfee: "Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy", Digital Frontier Press, 2012.
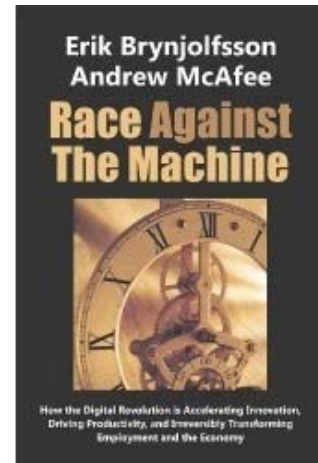
First of all, the reason why this book is reviewed in this column described. This book is thought to be within the scope handled by Space Japan Review by the reasons that this book quotes from Tyler Cowen's "The Great Stagnation" which was taken up previously in the Space Japan Book Review[1], that it is related to the space because NASA's report is cited and that the ICT (Information and Communication Technology) is a related theme, when a computer technology is treated. Now, let's start to introduce this book with related topics.

The first author of this book, Erik Brynjolfsson, is a professor of economy of the MIT Sloan School and another author, Andrew McAfee, is a chief research scientist of MIT Digital Business Center. This book is dealing with a serious problem of employment that will be deprived by the expansion of machine, in particular, computing power. First of all, three reasons are discussed as a cause that employment does not increase to match the economic development in recent years. First, the economy is not enough recovery according to the theory of business cycle that Prof. Paul Krugman is one of its supporters. Second, the theory that is caused by a long-term stagnation of innovation capability, being claim of Prof. Tyler Cowen. Third, the theory that technology development is too fast. This book advances the discussion following along the third theory. The Space Japan Book Review treated Tyler Cowen's "The Great Stagnation"[1]. As I said above, this is a motivation of this book review. "The Great Stagnation" seems to be still a hot topic today, because I saw his interview program of TV Ontario last fall in Canada[2].

With respect to the third problem above, it means that the growth of computing power has become large. We have to pay more attention to the impact to human skills, wages and employment. In this regard, it is described from two cases in this book. As the first case, the total number grains of rice to the n-th grid of the chessboard will be 2^n-1, in the way that one grain of rice is put on the first grid and doubles on the next grid. The total number of rice grains put up to first half of 64 grids of chessboard could be handled well, but the number for the latter half grid of the chessboard will become imaginatively impossible. The amount of memory is expected to be double every 18 months, according to Moore's Law. It is likely to be large enough to unimaginable after a time like the rice grain on the chessboard. In addition, the calculation speed has also become much faster by improving software technology. In other words, there is a potential that the ability of computer also becomes beyond imagination. By doing so, the work that humans have to involve is replaced to the computer, then it leads to a reduction in employment. Needless to say, the computer technology will be more powerful by combination with ICT technology.

It should be noted, in this case, that form of employment is differentiated into two parts, those are, the advanced creative work and services that use the manpower such as hairdresser, gardener and caregivers. In fact, a lot of manual labor is also requires a high degree of intellectual ability in practice. For example, a nurse or plumber is a job that requires problem-solving skills and ability of pattern recognition throughout the day. So it is difficult to automate their work. As an example proof, a little old, but word from the report of NASA in 1965 is quoted, "Man is the lowest-cost, 150-pound, nonlinear, all-purpose computer system which can be mass-produced by unskilled labor." This comment is said to be used to support the manned space flight. I think that a point of view of the weight of the equipment is space specific problem. There is still controversy of whether unmanned or manned space activity. According to this book it might be replaced with the computer all of the things in the future. But anyway if the work that human has done so far is replaced to the computer, I wonder whether or not human is satisfied with the work that is done by the computer in the case of the work that human has never done like in the space.

Even in the field of advanced intellectual labor, translation, medical care, and the game are

candidates to be replaced to the computer. However, there is a difference of about heaven and earth between the stereotyped and workaday sentence that is generated automatically and the ingenious one that is written up from zero. In this conjunction, Alan M. Turing, called the father of computer science, proposed Turing test in 1950 to find out whether the computer can act like a human being. Turing himself had expected that distinction between human and computer would no longer exist up to 70% at the test by 2000. However, it does not still be achieved.

It is with the impression of dark future to say employment is lost due to the progress of the computer in this way. But it is felt quite relieved that the authors of this book are not pessimistic. There are industrial revolution three times in human history. The first industrial revolution was led by the steam engine. Much employment has been lost by this revolution, but population, society and living standard grew dramatically unprecedentedly. The electricity was the driving force of the second industrial revolution. This second revolution has accelerated productivity growth rapidly in the 20th century. There was confusion and also crisis in both cases, but in the end, life of most people is much better than before. The authors of this book describes that there is a solution in partnership with the computer, that is, in that companies and workers put the machine to the side. For the countermeasure, it is desirable to promote both in terms of quality and speed of the organizational innovation, and to learn the skills that are required in not only current but also future to strengthen the human capital. Then 19 steps are proposed over the education, entrepreneurship, investment, regulatory and tax.

Description by Prof. Takao Komine, Hosei University, is attached at the end to this book. It is easy to read for me to help more understanding of this book.

Almost the same subject of this book is taken up in the Nikkei Shimbun on May 1 and 2, 2013 [3] [4] , although this book itself was not quoted. There mentions the necessity of education. In addition, it would be helpful because it is also mentioned to utilize large amounts of data and 3D printers.

In addition, this book is like a translation of e-books published in 2011, but the paper-based is issued in 2012. Further, the title of this book seems to be associated with the rock band name "Rage Against the Machine"[5], but I do not feel uncomfortable a little.

Lastly two things. Considering that the technology underlying the second industrial revolution was electricity, there was a behavior referred to as "electrical ... mere" in relation to the recent con nuclear movement in Japan, but it should base on full history. Further, the computer is more advanced, and moves to the second half of the chessboard, it may be a situation that no one can expect at present, the computer performs some additional work, such as writing book reviews like this, human resources like me may not be required.

References

[1] Takashi Iida, "Space Japan Book Review -From a satcom researcher point of view 'Tyler Cowen: "The Great Stagnation", Penguin, 2010, http://satcom.jp/English/e-75/spacejapanbookreviewe.pdf.

[2] Takashi Iida: "Topics From Within: Attending at Joint Conference of AIAA-ICSSC2012 and Ka-Band Broadband Conference", Space Japan Review, No.81, Oct/Nov/Dec/Jan, 2012/2013, http://satcom.jp/English/e-81/topicsfromwithin.pdf.

[3] Noriko Arai: "Economic Commentary　Computer Deprives Job−I　Sophistication of human resources education is the key", Nikkei Shimbun Newspaper, May 1, 2013.

[4] Noriyuki Yanagawa: "Economic Commentary　Computer Deprives Job−II　Ability that can not substitute is important", Nikkei Shimbun Newspaper, May 2, 2013.

[5] http://blogs.itmedia.co.jp/akihito/2012/08/race-against-th-9972.htm