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On the Verge of a Dramatic Age of Innovation Thoughts about “The Second Machine Age”

Miller: Hello everyone. I am Kazuko Miller, director of Musha Research. Today, I will talk with Mr. Musha about the second machine age, which is the theme of a recently published book. We have received questions about this book from a number of our clients. Mr. Musha has recommended this book so enthusiastically that some people thought he was working for the publisher. First, would you give us a brief explanation of this book?

Musha: I have been talking about this book frequently at seminars and other events. Some people are suspicious because they think the publisher asked me to promote this book. But I have had no contact at all with Nikkei BP, which published this book. So why have I been talking about this book so much? The original English-language version of this book went on sale about 18 months ago. I have summarized the points of the book in reports and other channels. In August, the Japanese translation finally appeared. I scanned the book in English but read it one more time in Japanese. This made me feel strongly about telling other people about the book. I am using every opportunity I have to talk about it. My main message is that I want people to read this book, rather than just what I wrote in my reports, in order to gain an understanding of what is happening in the world today.

Miller: Exactly what is happening in the world now?

Musha: We are seeing “the second machine age.” Eric Brynjolfsson and Andrew McAfee, the MIT professors who wrote *The Second Machine Age*, believe that the second industrial revolution has started. Naturally, that means there was a first industrial revolution. This revolution started about 200 years ago with the invention of the steam and the growing use of the power of machines. Therefore, this was an age when machines replaced human physical labor.

At that time, people and horses were the primary sources of power. There were more horses than people. But now horses no longer have a role in the business world. As a result, the emergence of enormous amounts of mechanical power during the first industrial revolution virtually eliminated physical labor that was done by people and horses. Thanks to this revolution, the people of the world have been able to enjoy a highly advanced level of culture and civilization. So what is the second industrial revolution that the authors of *The Second Machine Age*? They believe that we are advancing to an age where machines will replace the brains of people rather than their muscles. Robots, artificial intelligence, smartphones, cloud computing and many other advances are capable of replacing the mental work currently performed by people.

Operating automobiles is a prime example. Driving is obviously mental labor. But now there are motor vehicles that can move while making decisions on their own without a driver. In the book, the authors talk about how Google’s driverless car traveled down the 101 expressway between San Francisco and Silicon Valley. In Japan, Toyota has stated that it plans to start selling a driverless car by 2020. Apparently, this technology has reached the level of practical use. If so, then cars can operate without a driver or perhaps under the control of a smartphone. That means even an elementary school student could drive a vehicle. No one will need a driver’s license. It may even be possible for a machine to make decisions on its own in order to take children to school and bring them home, a task now performed by their parents.

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This is a remarkable accomplishment. But equally remarkable changes are about to occur in many other places. Machines now perform most translation work. And the book states that the work of a securities analyst, which is my field, will be entirely replaced by machines. These events would free people from performing mental labor, too. In other words, machines would take away jobs involving mental labor. About 200 years ago, a very large number of horses were used to perform physical labor. But now there are almost none. If we advance to an age where people who perform mental labor are no longer necessary, there will be no need for the physical strength or brains of people. Everyone will be unemployed. This will be an age where computers and machines take away our jobs. In fact, artificial intelligence is so powerful that computers have already beaten the most skilled masters in games like chess and shogi. These feats demonstrate the tremendous power of machines.

This book talks about what sort of age this will be and how we should look ahead to the future. In this sense, the book is extremely thought provoking. I believe this is a book that clearly untangles in a straightforward manner the issues that the world already faces.

Miller: In the age you described, there would be nowhere for people to do anything.

Musha: That's right. Basically, machines would do almost everything just as people have been doing until now. Today, there is almost no need for physical labor by people. Athletes like figure skater Mao Asada and baseball player Ichiro would still use their bodies. But ordinary people would no longer perform tasks requiring physical strength. Once this happens, people who perform mental tasks will disappear. This is a problem. No one will have a job.

So how should we regard this age? I think this is an extremely critical issue for economics today. If machines replace people, productivity will rise dramatically with an unlimited upside. After all, we will be able to do anything with almost no labor input. That means labor productivity will skyrocket. About 200 years ago, the industrial revolution replaced physical labor with machines. Now, we are seeing machines begin to replace mental labor. Both revolutions are linked to dramatic upturns in the productivity of people. We may even be able to do anything with no labor, which equates to infinite productivity. If we advance to this type of age, everyone will be unemployed. Consequently, it is possible to adopt the pessimistic view that technological progress will lead to a dark future where no one has a job.

During the industrial revolution that started about 200 years ago, there was a widespread Luddite movement in England. People destroyed machines that they thought were taking away their jobs. This was not regarded as actions for protecting the rights of workers. Instead, Luddites were viewed as a reactionary movement that aimed to stop progress involving technology and people. Today, people are afraid that they will lose their jobs unless they destroy the computers. This is a very serious problem. The economy may collapse as machines take away our jobs and everyone is unemployed. But if this does not happen, then I think we will at some point have to interpret these events as an indication of a bright future.

Miller: October 21 was the date 30 years in the future that appeared in the movie *Back to the Future*. Things that we could not imagine 30 years ago are actually happening today and are still progressing. But we still have jobs and our lives are better than they were 30 years ago.

Musha: That is the key point. Technology was very advanced 30 years ago. We had computers then and subsequent rapid advances in computer technology boosted productivity. So computers should have stolen a large number of jobs. For instance, a variety of companies had enormous workforces for data processing 30 years ago. Accounting, sales and other data were all processed by hand. Some people even used an abacus. Today, all of these jobs have disappeared. So a massive number of people have been removed from the workplace. However, there has been no increase at all in the number of unemployed people during the past 30 years. Clearly, we are not witnessing economy weakness caused by growing unemployment as jobs are taken away. This is also true if you look back at human history. The most noteworthy illustration is the sharp upturn in productivity in the agricultural sector.

About 200 years ago, 74% of the U.S. population lived on a farm. That means the hard work of 74 out of 100 people supplied enough food for those 100 people. Today, only two out of 100 people in Japan and the United States are farmers. So the work of only two people is needed to feed 100 people. The dramatic increase in agricultural productivity means that 72 of every 74 people who worked on a farm lost their jobs. Consequently, if we assume that people's lives did not change in any way, then the rise in agricultural productivity should have created substantial unemployment as long as living standards remained the same as 200 years ago. But this did not happen. The 72 people who left the farm were not unemployed because they found new jobs. And those jobs involved tasks that steadily made people's lives even better and more fulfilling. Demand for food is met by only

two out of 74 farmers because of rising agricultural productivity. The remaining 72 are employed in industries (businesses that did not exist 200 years ago) that contributed to improving the quality of life for everyone. People can enjoy good clothes, housing, education, health care and entertainment. New jobs emerged in order to support progress with making life more enjoyable and rewarding. This is the history of mankind.

Figure 1: US Agricultural productivity

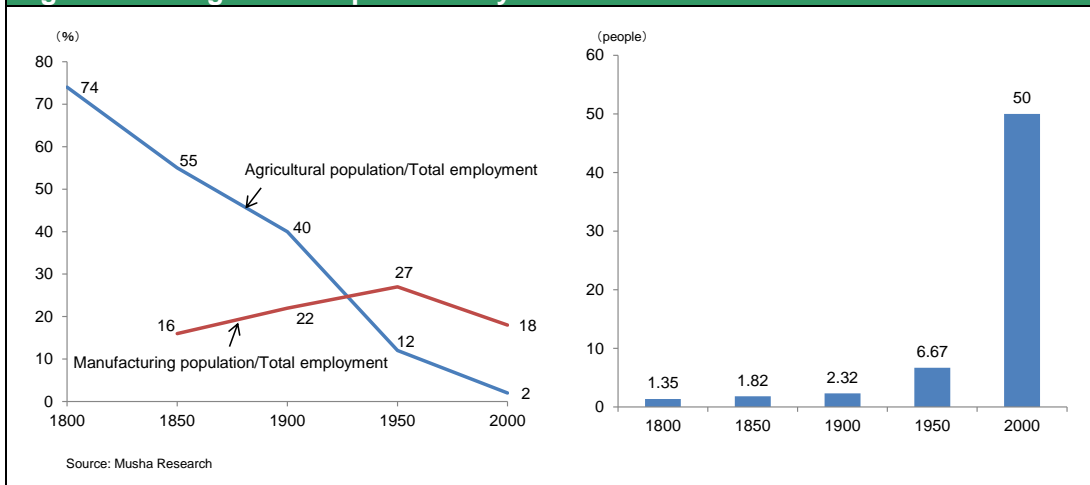
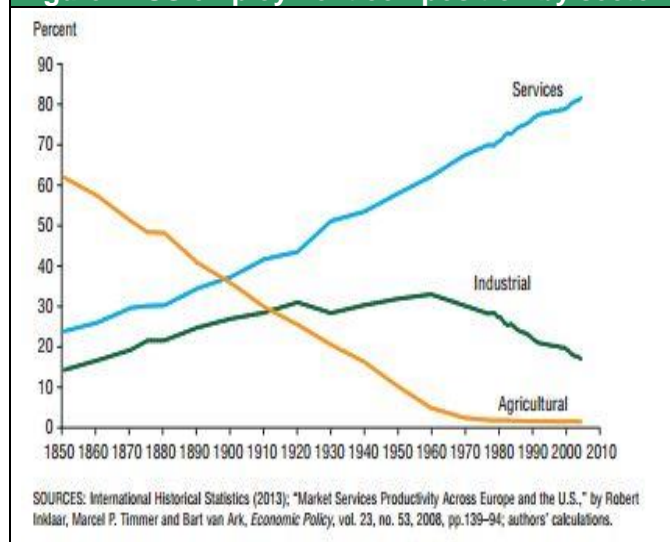


Figure 2: US employment composition by sector



As rising productivity creates more surplus labor, jobs will be created as unemployed people find new work that helps make others even happier. For example, there are no longer people engaged in physical labor. But you can't say that you and I are not using our muscles at all. If we don't use our muscles simply because our jobs don't involve physical labor, we will age and our bodies will weaken. This is why we must use our muscles even though it is not for work. That means enjoying sports. Once machines perform physical labor, we need to replace that labor by focusing energy on sports. The result is growth of the sports industry and the creation of many jobs.

With sports, we use our muscles for fun rather than to perform a difficult job. And now, we no longer need to use our minds to perform difficult jobs. Instead, we can use our minds for more enjoyment. For example, we can enjoy the arts, entertainment and literature. This will in turn create more jobs in these sectors. From this standpoint, the ongoing second machine age in which machines replace mental work of people will not lead to a dark future. We will instead be set free from boring, mind-numbing mental work. This will allow people to enjoy life by using their minds for better purposes. Consequently, the new industries that will appear and prosper will be in fields that make people even happier. I think these new industries will probably become the biggest source of jobs in the future. Therefore, The Second Machine Age is faintly pointing to a future in which the fastest growing industries involve activities that make people's lives more enjoyable.

Recently a book titled 50 Jobs That Will Disappear in 20 Years has generated much interest in Japan. This book states that the kinds of machines described in The Second Machine Age will steal our jobs – 50 types of jobs. However, I believe that a different critical component is missing in the book about 50 jobs. The book should also

talk about 50 jobs that will be created during the next 20 years. Looking back through history, we can see that when 50 jobs were lost because of new technologies and rising productivity, 50 new jobs were subsequently created. This is the history of human progress. Moreover, all of these new jobs play a role in making people happier. Therefore, we can say that our skillful use of rising productivity and the industrial revolution means that we can look ahead to an even brighter future. Achieving this bright future will require policies for establishing an environment in which demand can be consistently increased and people's lives can become even better. This is why I believe we are reaching a stage where enacting the proper policies will be critical.

Miller: I see. There is no need for pessimism because new industries will emerge. People will not lose their jobs and unemployment will remain low as new jobs appear due to the creation of new demand and innovation.

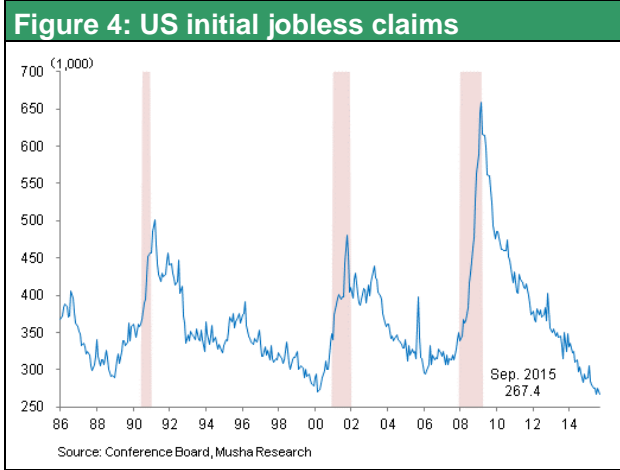
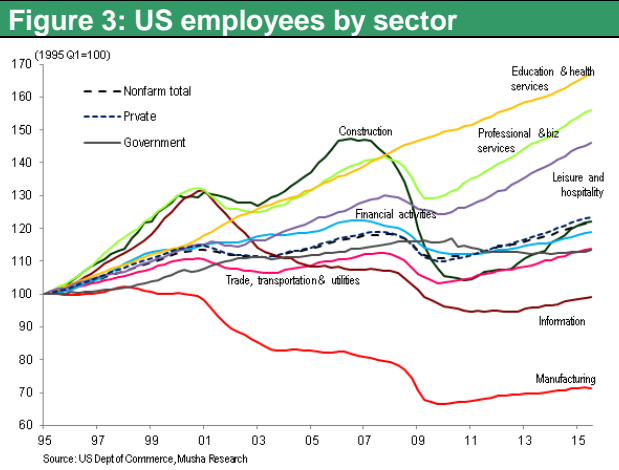
Musha: The most important point is that people will not have to use their minds or their bodies. Machines will do everything. This will make our lives very easy. Our life styles will undoubtedly become even better. One hundred years ago, Sunday was not a day of rest. The only holidays were summer vacation and the New Year holiday. A few decades ago, people began to stop working on Sundays. Saturday became a day off as well not long before I finished school and started my first job. For several decades, only one Saturday each month was not a work day. Now, every Saturday is a day off. There are also national holidays and some companies are talking about three-day weekends. I am certain that we will advance to a three-day weekend at some time in the future. Next, there may be four days off each week and perhaps even no work days at all. Less working time would create more and more free time. People would need to try various new ways to utilize their surplus brain and physical energy. At the same time, people will have a good income because rising productivity will generate earnings for companies. The result will be paradise. I have constantly stated that society is evolving and advancing toward this type of paradise.

We should pay close attention to changes in life styles and spending patterns of people in the United States, which is the world leader in technological progress and innovation. After the global financial crisis, among the world's developed countries, the United States had very strong corporate earnings but a substantial surplus of labor and capital. Wages were low (creating the risk of deflation) and interest rates fell to a historic low. This was a situation that does appear in textbooks. A dramatic upturn in labor productivity fueled by the second industrial revolution held down job growth. The result was rising unemployment and low wages. At the same time, the cost of equipment and systems plummeted because of technological progress. Capital productivity increased as a result.

Companies have been generating strong earnings even amid a surplus of labor and capital. This was a situation that could not be explained by using conventional economics. Pessimists interpreted this as a sign of a deepening crisis. They believed surplus capital was responsible for the loss of jobs, low wages and low interest rates and that this capital was not sufficiently used for investments. It is true that an economy will collapse no matter how much money companies earn if nothing is done about unemployment. This is why we cannot ignore the possibility of this situation becoming a crisis. However, full employment and a further improvement in living standards are possible if the skills of workers are upgraded and the economy grows. Eventually, surplus capital at companies will support growth in consumption through higher wages, more distributions to shareholders and higher stock prices. And these events will contribute to a further improvement in the quality of our lives.

After the start of the financial crisis, the United States used massive quantitative easing and other measures to create demand. Due to these actions, there has been steady progress with the use of surplus labor and a big drop in unemployment. New unemployment insurance claims have fallen to an all-time low. As you can see in Figure 3, there has been significant growth in the number of jobs in sectors that make our lives more fulfilling and enjoyable. Examples include education, health care, services, entertainment and tourism. There is also an unmistakable upturn in wages. Innovation driven by the Internet, cloud computing, smartphones and other advances is beginning to produce momentous changes in how we live and how companies operate.

The future will not be determined by a hypothesis or theory. What happens will instead depend on government policies and how people utilize their knowledge. I believe that The Second Machine Age (Nikkei BP) does an excellent job at starting to explain this situation, including my own beliefs. With the technology revolution and new combinations starting to produce major benefits, the world is now advancing to a new age of dramatic innovation.



Miller/Musha: Thank you.

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