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Interview with Kazuo Yano, Corporate Officer & Corporate Chief Scientist, Hitachi Ltd. Research & Development Group

# Artificial Intelligence (AI) to Meet New Challenges in an Age of Uncertainty

By Japan SPOTLIGHT

Al is the latest product of modern science and technology, and new technology is occasionally exposed to challenging remarks and criticism often based upon misperceptions. Dr. Kazuo Yano, who has worked on Al for 10 years at Japanese electronics giant Hitachi Ltd., wants such misunderstandings to be erased as quickly as possible in the interest of human beings who could be the largest beneficiaries of Al. He has published a number of papers, articles and books on Al to tackle these misunderstandings. His book "Data's Invisible Hands" (2014), published in Japanese, has won a high reputation and succeeded in raising interest in Al in Japan. According to Dr. Yano, Al would enhance not only labor productivity but also human happiness. The evolution of humankind towards what American business management philosopher Peter Drucker calls a "knowledge-oriented society" — which highlights knowledge as a key to achieving enhanced productivity — would depend upon a correct understanding of Al. *Japan SPOTLIGHT* had the following interview with Dr. Yano.

### Introduction

#### JS: Could you please briefly explain how you started studying Al?

Yano: Yes. We had been working on research on semiconductors for the two decades until 2003 and our research was then very close to the top level in the world. However, at Hitachi we were determined to stop our semiconductor business in 2003. In our research institute we had been engaged in more than 200 semiconductor research projects. I was one of those researchers working on them as a director of a department. All of us had to find new research work to replace the research on semiconductors. In our discussions we thought that data could play a more important role in determining the future direction of the development of computers or the role of computers in our economy



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and society, rather than computer hardware, as computers are now smaller and their functions more advanced. So since that time we have been concentrating on research on a data collecting system or data analysis, and even expanding our research target to domains like machine learning or AI. This means that we started our research on a wide range of subjects like big data, wearable computer devices, IoT (Internet of Things) and AI much earlier than anybody else in the world.

From the beginning of our research until only a few years ago, we were in general less convinced that our work dealing with big data could result in any added value or profits. We found data analysis itself could not create anything fruitful, no matter how much we spent on it. So we noted that we should pursue research with the aim of avoiding the wasteful process of just dealing blindly with any kind of data, and then decided to focus on data leading directly to profits, the most crucial outcome for a private business. Thus we selected Al as our potentially profitable research target five years ago. This is because after having struggled with big amounts of data, we found data analysis or data application should be categorized into certain patterns, though it may seem at first glance to be something to be treated individually and specifically. We became convinced that this

work could be well done by computers and also fit very well with AI, since we could create a sort of software automatically from the data itself.

It was a couple of years ago when AI started drawing attention in our business, and we are now starting to use it for a wide range of business operations. In April 2016, Hitachi announced its new business plan for a more service-oriented business rather than providing only products like computers, compressors or turbines. Al fits this new business strategy as well. So I would say Hitachi would be the finest place for AI researchers to work and thus I believe that we can do the most advanced and highest quality research in the world.

### JS: How do you assess the international competitiveness of Japanese AI, for example as compared with the United States in Silicon Valley?

Yano: The American AI companies like Google, Amazon and Facebook providing services on the Internet all have lots of web data as well as infrastructures for computers and computer software. In this regard they are all excellent players and their competitiveness is not to be underestimated. However, Hitachi is in a very good position in taking advantage of a wide range of business data coming from our 10 trillion yen business in total, consisting of 10 kinds of one trillion yen businesses such as electric power, railways, water, banking and financial institutes, distribution, elevators, and construction machinery. We have contacts with a large number of clients on a daily basis in such a large-scale and widely varying business. There is no other company in the world that could enjoy the advantage of holding such big data.

In addition, assuming that AI is the generalization of software, while a computer is the generalization of hardware, Hitachi would be in the best position in defining such generalized software for each of the one trillion yen businesses in these 10 business areas.

We have a wide range of data affecting client outcomes and know very well how to deal with them. We have arranged an infrastructure of the generalized software for AI rather than spending money on human experts to take care of a client's specific data to raise their outcome. Outcome means profits in a client's business and it means how to raise its sales or lower costs. or how to raise customers' satisfaction and the number of customers. Our Hitachi business has been to sell our products like computers, compressors and turbines to our customers, but today we see our products becoming more like commodities and tending to be sold at a cheaper price. With such hardware alone, even though its guality is high, they cannot earn profits, so in order to raise our business clients' profits Hitachi should provide them with knowledge about what functions and data could make their businesses digitalized well with the same hardware. In my observation, Hitachi's business structure will enable us to enjoy a big advantage in doing so.

### **AI & Happiness**

### JS: Among these outcomes you mentioned, "happiness" is a unique concept that you refer to in your book. A wearable sensor can measure it. This is a very new idea that nobody has ever thought of.

Yano: We found that we could get all kinds of data on a human body's actions by acceleration sensor. We are also learning that the patterns



among those big data show signs of human vitality and happiness. We found a strong correlation between the result of the responses of the employees to our questionnaire on their happiness — such as "How many days a week do you feel happy?" — and the action patterns in their offices. In 2015, we announced this research outcome to the public. As I said, profit is the main outcome but above all happiness is the ultimate outcome for men, since profits should lead to happiness. Outcome is crucial for AI.

As for computers, we need to configure them to achieve these outcomes, but in the case of AI we would need to input what we want to be achieved, namely outcomes. We would not need to instruct AI on how to achieve it as such software is all generalized in AI. AI could think about how to achieve it by itself. With the input of happiness and a rise of productivity or motivation as the outcome, AI could automatically calculate how to achieve it, though a human being could not. More concretely, we input all the action data of the employees measured by a wearable sensor for a generalized software of AI and created a feedback system between the factors seemingly affecting happiness, such as communication style among the employees or how to use time in your office, and the measured happiness in order to raise the level of the happiness of the person equipped with the sensor and the colleagues around him or her. Thus, I believe that AI has understood what constitutes human happiness.

For example, in a call center, we developed a dashboard software for happiness and let it output whom a supervisor should talk to prior to anybody else in terms of raising motivation. After one year's practice with this system, we have seen a 27% increase in orders received there thanks to an increase in happiness leading to higher motivation to work and eventually higher efficiency of work.

Since our announcement on AI to serve for raising happiness in a company's office life last spring, we have numerous orders from more than 10 large companies. This is truly big progress, since happiness can be considered as the ultimate outcome for human beings anywhere under any circumstances. AI can tell you how much communication among colleagues in your office would be optimal or how long they should work to achieve the best in terms of happiness and motivation, depending upon the working environment and

whatever. This is a unique discovery.

#### JS: Have you ever made it public overseas?

Yano: Yes. I have given a presentation on it for a number of overseas academic associations. In June 2015, I gave a presentation at the Innovation Festival in Cannes, France. I also made a keynote speech at an international conference.

# JS: Do you think your innovation will have an impact on government administration?

Yano: Yes, indeed. We believe that with AI as such everything will be digitalized. Generalization of software, the essence of AI, would lower the cost of innovation remarkably. AI would create many ideas and alternatives and precise evaluations for them based upon all the available data combined, and thus there should be no other option but to use it to lower costs.

### Human Beings in the Age of AI

## JS: What are we human beings expected to do for these outcomes?

Yano: Devising AI is devising a goal and also devising software to reach the goal as systematically as possible. So far we have been working on a procedure for solving each specific issue but now for AI we are working on generalized software to be applied to any circumstances in general or even to any unknown situation in the future. To get this done well, we will need people who can map the existing extremely complicated real questions that a company or an individual is facing into a scheme for AI to solve them. Therefore, from now on, we can focus on making innovations that we have never thought of, with the aid of AI.

### JS: So are we getting into a "knowledge society" where all of us must be well educated?



Yano: Yes, we are finally getting into the "knowledge society" mentioned by Peter Drucker in his books. In the last century, we did not realize it, but now in the early 21st century we are finally achieving the infrastructure to realize it as in Drucker's prediction.

### JS: Well, then, is there any possibility of an income gap expansion between intellectuals, who can afford to be the beneficiaries of this advanced education, and others in a "knowledge society?"

Yano: No, I do not think so. A "knowledge society" led by AI has nothing to do with income inequality expansion. Income inequality is the cost of freedom and will not either decrease or increase due to the existence of AI. Perfect equality will not be realized unless we intentionally create it. I think freedom and equality cannot be simultaneously achieved but will always be in trade-off relations. This is up to our own choice between freedom of economic activity and equality of income and asset allocation in the outcome of those economic activities. If we subordinate all economic activities to freedom, whatever we may do, we will see a significant increase of income inequality. Whether we have AI or not in our society has nothing to do with it. In short, income inequality will continue unless freedom in economic activities is restricted.

Each individual has his or her own unique capacity and background such as his or her parents' wealth or good luck in being closer to a network of influential people in society. These factors affect income inequality between people. With more freedom, we will see more inequality, as in the US.

### **Implications of AI for Human Resources**

### JS: How do you think AI will affect our education in a "knowledge society" where learning has much more important meaning?

Yano: I believe that we must work hard to learn about AI. The classification by experts between a natural science major and a social science major will be meaningless. We all have to work on learning about AI very well. AI is not merely a computer algorism but a drastic change of ways to solve problems. So far we have been working on finding the process to achieve a goal, but now we have found that the process as such could be largely made available by a computer. This is much less costly and would make it possible for us to pursue a wide range of alternative processes. All of us must choose this approach.

Let me mention about a misunderstanding about AI today spreading over the world. On the latest news on the Go match between a human champion and AI, the media highlighted the AI's victory over a human. This is a serious misunderstanding of the incident and could lead in the wrong direction. The match, as a matter of fact, was one between a human Go champion and other human beings, a project team led by Dr. Demis Hassabis that had worked on analyzing all the data of Go matches and thinking systematically about each play in each specific situation of the game by using computers. The victory of the alpha computer Go software over a human champion just means that the second approach has beaten the first approach based upon human skill and experiences.

All of us need to learn about Al. We are lucky to see the Internet available anywhere, as this means our learning cost is significantly decreasing. Within one month, you can learn almost everything about Al by using the Internet. You can supplement your knowledge later by further in-depth academic study or talking with some experts through their networks. What matters is your readiness to learn about it.

JS: Al affects not only science and technology but also the economy and society. To avoid misunderstandings about Al and encourage everyone to learn about it, would it be useful to set up a venue for discussion among people from various backgrounds?

Yano: Yes.

### JS: Would it be a weakness for Japan to have a silo mentality in organizations where information and knowledge are not shared with other departments?

Yano: No, I do not think so. We see it anywhere in the world. There would be no academic associations without a silo mentality. I think the key question is the mobility of the experts. For example, in the US, there are more ambitious people than in Japan keen on rising to be the number one expert in a specific area rather than one where stronger experts are already active. In this regard, experts in the US are more open to areas that are not their own. They are always looking for a place where their strengths can be fully utilized.

## JS: So should Japan pursue more diversity in our business and society?

Yano: Yes. That is important. Al would also raise our mobility, as a digitalized organization or business could lower the cost of all kinds of production operations as much as possible. Producing software or raising funds by crowdsourcing would be one example. Al would accelerate the speed of this trend.

### **AI & Risk Management**

JS: Risk management is becoming a big issue for us, such as the risk of terrorism or geopolitical risks in the Middle East, or the risk of Chinese economy. For management of such rising risks, would it be possible for us to use AI?

Yano: Yes. Not only on the side of defense but also on the side of offense, they use AI for cyberattacks. Thus this battle might end up in a combat between AI and AI. For AI, risk mitigation and raising profits or value are the same as the outcomes to be achieved. A difference

might be in handling very unusual events like earthquakes in the case of risk mitigation that would make it extremely difficult for AI to work effectively, since we cannot get data unless those unusual events happen.

JS: We are facing global risks and would need to get data from anywhere in the world. Will we need to have international cooperation on global risk management?

Yano: Yes, indeed.

JS: Hitachi is a global company, so global business information including risks must be coming to your company. Would that be your strength in global risk management as well?

Yano: It may be true, though we have not reached the stage where we can systematically utilize the potential of such huge data.

### **AI Indicator to Replace GDP**

JS: On the question of the possible impact of AI upon the economy, could AI and a wellness sensor create a good economic indicator reflecting human happiness rather than GDP?

Yano: Yes, I guess we could find such good indicators soon. I believe that happiness measured by our wellness sensor has a strong commonality among all human beings, regardless of nationality.

### **Future Research Plans**

# JS: Finally, I would like to ask you about your future research plans, if I may.

Yano: I would like to do my best to promote the concept of AI in the interests of society, while working to mitigate misunderstandings about AI that may cause people to oppose it, such as AI taking human job opportunities.

We are now facing a remarkable paradigm shift. Up to now, we have been raising productivity by taking advantage of standardized working systems created by "scientific management". In the age of AI when a "knowledge economy" rules, this system would not work well, since a "knowledge economy" would make it difficult to standardize working processes, exposed to drastic changes in working conditions. Every worker will need to choose a goal or desired outcome of their own, and AI would then provide them with a way to respond appropriately to the changes in working conditions in a time of uncertainty.

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