

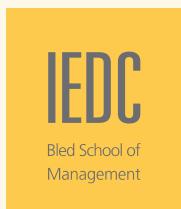
Artificial Intelligence and its Impact on Leadership

DANIEL SUSSKIND

2018



“The question is not, whether a machine can exercise judgment, but whether it can deal with uncertainty better than human beings.”



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Artificial Intelligence and its Impact on Leadership

DANIEL SUSSKIND

Welcome Address by Prof. Danica Purg, President of IEDC-Bled School of Management

Your Excellencies,

Dear Minister Boštjan Poklukar,

Dear State Secretaries Mr Vojmir Urlep and Mrs Eva Štravs Podlogar,

Dear Mayor of Bled,

Dear Professor Susskind,

Dear Professors Claudel and Casse,

Dear guest speakers, Mr Barz and Mr Zhang,

Dear guests from 25 countries,

Good morning and welcome to the IEDC Annual Presidents' Forum. I am happy to see so many old friends here. Some of you have come to this event from far away and I appreciate that. I also see many new faces. Last but not least, several prominent guests from business, education, and government have joined us to participate in our discussions on artificial intelligence and its impact on leadership.

I am convinced that we must work together to prepare successfully for the future. Business people, business educators, and policy makers need to collaborate. We have to work across industries, state borders, and intellectual boundaries, breaking all paradigms of education, skill enhancement, workforce development, and evaluation of progress and performance. Together we must ensure an ethical and level playing field for all components of our society. We started teaching ethics at our school 27 years ago. I am very proud that we were one of the first schools in the world to realize the importance of this subject.

This year's topic – artificial intelligence – can be loosely defined as multiple technologies combined in different ways to sense, comprehend, and act. These three things are interconnected, and they have the capability to grow and develop by learning from experience and adapting. This self-learning ability is what makes artificial intelligence completely different from anything that we have seen before. Although we are going to hear more definitions, I am sure that you all agree that artificial intelligence is a game-changer. The world's business and political leaders have taken note of this.

To help us make sense of what all this means, we have invited a renowned economist and book author, Dr Daniel Susskind. He will give today's keynote presentation on artificial intelligence. We have also invited two great professors of leadership who will discuss the impact of artificial intelligence on leadership.

Dr Susskind is a fellow in economics at Balliol College, Oxford University, where he teaches and does research. Previously he worked in the strategic unit of the cabinet of the Prime Minister of the United Kingdom. He was also a Kennedy scholar at Harvard University. In his best-selling book The Future of Professions; How Technology Will Transform the Work of Human Experts, published by Oxford University Press, he predicts the decline of many professions as we know them today as they are replaced by artificial intelligence. Many professionals will be replaced by increasingly capable systems. Leaders will be confronted with a major issue: how to educate the young and reeducate the old so that they can lead globally connected and decentralized organizations. They will also have to stay alert to the ethical issues associated with the world of artificial intelligence.

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Following Dr Susskind's presentation, we will listen to a panel of experts led by Professors Casse and Claudel. They are our professors of leadership, and have a lot of experience in the corporate world. Pierre Casse heads the leadership chair at the IEDC-Bled School of Management. He is also professor at the Moscow School of Management Skolkovo. He has been a visiting professor at a number of renowned business schools in Europe and the United States. Professor Claudel is a freelance international consultant. He runs seminars on human resource management, organizations, leadership, and the application of philosophy in business at major universities in Europe and the United States, including IMD Lausanne and Kellogg School of Management. Professors Claudel and Casse are also authors of some great books on leadership. Professor Claudel will lead today's Forum.

We have also invited two leading experts to take part in our panel: Mr Frank Barz, head of Industrial Internet of Things at T-Systems Multimedia Solutions, Germany, and Mr Nicholas Zhang, chief architect, research scientist and director of the Future Network Theory Lab of Huawei, China. They will discuss how we should all prepare for the inevitable changes that our society will experience. Mr Barz has over 20 years of experience with Telco & Utility related services in Europe and North and South America. For the past five years, in his position as the head of I-IOT, Frank has been a consultant to small and medium enterprises in the area of digital transformation. Mr Zhang has over 15 years of research experience in the system architecture of networks and distributed communication systems and has contributed to more than 90 globally filed patents. In 2014, while still a principal researcher, he became the director of the Future Network Theory Lab. Mr Zhang participates actively in a number of associations, such as Sigcomm, ICNP, INFOCOM, ICDCS and ICCCN.

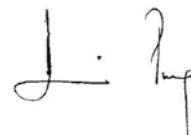
All participants will naturally be invited to join the discussion after this panel.

May I remind you that this event will be recorded, and that an edited transcript of the presentations and discussions will be published as the IEDC Book of the Year. This will be the 32nd publication of its kind, as our school is 32 years old. IEDC, the oldest business school in Central and Eastern Europe, sends these booklets to more than 10,000 addresses across the world as a New Year's present.

Because some of you are here for the first time, I would like to inform you that you will see a lot of art on our premises. Art is shocking, provoking, and inspiring. We would like to have you reflect through this art and get inspired. We have art here because we believe in art in leadership, ethics, and sustainable development. We want those who study with us to not only know more, but also to feel more. We also want them to be able to see and hear more. Today's managers need these skills more than ever.

Now I invite you to listen to the video-recorded address by the Prime-Minister of Slovenia, Mr Marjan Šarec. Unfortunately he was unable to be with us in person today.

I thank you all for coming and wish you a very inspiring day.



Prof. Danica Purg
President

Opening Address by Mr. Marjan Šarec, Prime Minister of the Republic of Slovenia

*Dear Dean Prof. Danica Purg,
Dear esteemed guests and speakers,*

First of all, please accept my apologies for not being with you at the Presidents' Forum in Bled: I am abroad.

The Presidents' Forum in Bled has become a well-known international event that has seen generations of leaders grow and develop. These managers are fully aware that only development, only knowledge leads to progress.

Slovenia is a country that does not have many natural resources. However, it has a lot of knowledge, and if we know how to use this knowledge well, and how to share it, we will become very successful internationally.

It is important to share our expertise, and it is important to acquire new knowledge, as it is a known fact that those who do not develop, cannot compete. Competition is tough, and it becomes tougher every day in a globalized world. Hence the role of the Presidents' Forum in Bled is becoming even more important.

Dear Dean Prof. Danica Purg, I wish you a successful Forum, full of engaging discussions and interesting lectures. I look forward to meeting you next year!

Thank you!

Introduction to the Forum's Topic and Agenda

PAUL CLAUDEL

Good morning. I am going to spend only a couple of minutes introducing the program because we need to get to the point very quickly.

Danica gave you one definition of artificial intelligence. For those of you who are not familiar with the subject, another short definition might be useful. It was proposed by the company Infosys. I think that it is pretty good, at least as good as any other. According to Infosys, artificial intelligence is software technology that makes a computer or robot perform in a way equal to, or better than, normal human computational ability, accuracy, capacity, and speed. You can find examples of this in natural language, knowledge processing, automated reasoning, machine learning, robotics, rational agents, and chatbots. This gives you an idea of what we are going to get into.

We might also touch on another subject: transhumanism. It is a shocking and frightening concept, a class of philosophies of life that seeks the acceleration of evolution of intelligent life beyond its currently human form and human limitations by means of science and technology, guided by life-promoting principles and values. It is a bit abstract and complicated. It is about enhancing the human being. It can take us to a zone that we are not yet familiar with. But this is a fast-moving world...

This forum will explore and discuss the effects of artificial intelligence and transhumanism on our professional and personal lives, with an emphasis on business and leadership. We will have a keynote presentation by Dr Susskind. After that we will have time for questions and answers. After the break we will form small groups and ask you to put your heads together, discuss some ideas, and share them with the panel. In that way we can have an exchange between the panel and the audience on these specific topics. This will be followed by a wrap-up session during which we will ask you to share your thoughts on what we have done. Now I pass the floor to Dr Susskind.

ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON LEADERSHIP

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Daniel Susskind*

Thank you very much. It is a great pleasure to be here with you. In the next 25 minutes or so, I will be talking about artificial intelligence and its implications for leadership. I would like to begin by setting out two futures that I see for the professions. I will talk about the patterns that are taking shape across them. Having done that, I will talk about technologies, and one technology in particular – artificial intelligence – and our way of thinking about what is happening in that field, and why it is significant for those who have gathered here this morning. In closing, I will discuss what this means for the work that people do, and identify the implications for leadership, the focus of today's gathering.

A lot of what I am about to say this morning draws on a book that I co-authored in 2015. It is called *The Future of the Professions*. I wrote it with my father, Richard Susskind. One of the questions that we are asked is how we came to write this book together. If any of you in the room have a legal background, you might be familiar with my father's work. He has spent the past 40 years trying to understand how technology and artificial intelligence affect the legal profession. In the 1980s he wrote his doctoral thesis on artificial intelligence, and for almost four decades he has been trying to build systems that can solve legal problems. When talking to audiences of lawyers, particularly in the last few years, a stray doctor, consultant, or teacher would approach him and say, "What you are saying about the legal profession sounds very interesting. It also applies to our profession, to the same extent".

He and I talked about this for the first time in 2010. At that time, I was working in the Policy Unit in the Prime Minister's Office at 10 Downing Street. I was working in a range of policy areas, with a good overview of lots of different professions. And it was clear then that significant change was in

the air. These professions appeared to be facing a common set of challenges, so we had the idea of joining forces to look at the professions more generally so as to understand what artificial intelligence was doing to them. The result was the book. In it, we set out two futures for the professions. The first is a reassuringly familiar one. It is simply a more efficient version of what we have today. Professionals of all types use technology, but they do that essentially to streamline and optimize the traditional way in which they work. If you look across the professions, you will see a lot of examples. Doctors talk to patients via Skype. Architects use design software to design big and complicated buildings. That is the first future.

Then there is the second future. This is a very different proposition. In the second future, technology does not just streamline and optimize the traditional way in which people work, but actively displaces people from that work. So-called increasingly capable systems and machines are designed and operated by people who look different from traditional professionals. These systems and machines gradually take on more and more of the tasks that we associate with those professionals. For now and in the medium term, these two futures will exist in parallel. In the long run, however, the second future will dominate. Through artificial intelligence we will find new ways of solving problems that, traditionally, only a very particular type of professional could solve. This presents an existential challenge to traditional professions.

I would like to pose a fundamental question now to which I will return later. Why do we have these professions at all? Why do we have doctors, lawyers, teachers, accountants and architects? The answer is that although they all look quite different from a distance, actually they all provide solutions to the same problem. The problem is that nobody can know everything. Human beings have limited understanding of the world around them. So we turn to professionals, because they help us solve all the daily challenges that we face but cannot solve on our own. In our society, professionals have the knowledge, experience and practical expertise that it takes to solve our problems. They operate under a grand bargain. It is an arrangement that differs across professions and jurisdictions, but it entitles the professions (often to the exclusion of others) to provide certain types of services. Professions are entrusted with the role of gatekeeper: each is responsible for its unique body of knowledge. Lawyers look after legal knowledge, doctors look after medical knowledge, and so on.

This is our analysis of the professions in a print-based industrial society. However, we are no longer in that kind of society. We are in a technology-based Internet society. And the traditional professions are



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breaking, in a variety of ways. First, they are unaffordable -- most people do not have access to the expertise of first-rate professionals or, in many cases, of any professionals at all. Secondly, by and large the professions rely on a pretty antiquated way of producing and sharing knowledge and information, despite the existence of feasible alternatives. Thirdly, they are opaque. Sometimes this is because the work of professionals is genuinely too complicated for ordinary people to understand. But take a walk across a British courtroom and look at the wigs and the oak paneling. You get a sense that there is also some intentional mystification at work in the professions.

Finally, the professions underperform. By this I mean something very specific. Given the way that we organize expertise in society, storing it in the heads of professionals and their institutions, the finest practical expertise and finest ability to solve all these difficult problems is an incredibly scarce resource. Only very few privileged and lucky people have access to it. As we move from a print-based society to an Internet society, though, professional work becomes organized in a new way. Might there be new ways of solving problems that, traditionally, only very few professionals were capable of solving? Do we still need those traditional gatekeepers?

Trying to answer that question, we went to institutions that were using technologies to solve a whole set of different problems in new ways. We have hundreds of case studies, but for now I just want to give you a flavor of what I mean.

In education, the number of people who signed up for Harvard's online courses in one single year exceeded the number of people who have attended the university in its entire existence. At Stanford last year, a team of researchers in medicine announced the development of a system that can analyze a photo of a freckle and tell you as accurately as leading dermatol-

ogists whether or not that freckle is cancerous. Another system, developed by DeepMind, an artificial intelligence company in London, can diagnose up to 50 eye problems as accurately as leading human ophthalmologists. In the world of journalism, Associated Press began to use algorithms to computerize the production of their earnings reports. In this way, they now produce 15 times as many earnings reports as when they relied on traditional journalists. In the legal world, 60 million disputes arise on e-Bay every single year, and are resolved online without the involvement of any traditional lawyer using what is known as an e-mediation platform. Just to put those 60 million in context, that is 40 times the number of civil claims filed in the entire English and Welsh justice system. It is three times the number of lawsuits filed in the entire US legal system.

Last year JP Morgan announced the development of a system called “contract intelligence”. It scans commercial loan agreements. It does in a matter of seconds what is estimated to require up to 360,000 hours of traditional legal time. In financial markets, it is estimated that 50 percent of all trading activity is now automated. In the world of taxation, last year about 50 million Americans used online tax preparation software to complete their tax returns instead of using traditional tax accountants.

Think about the traditional way in which an audit is done. It is not possible to review all the financial transactions of a company, so auditors take just a small sample, use various statistical methods to ensure that the sample is representative, and extrapolate, drawing broader conclusions about the general financial health of the company based on this narrow excerpt of data. That is the traditional approach. Now, though, there are algorithms that instead allow analyses of the entire body of a company’s financial transactions, and hunt for irregularities that way. A Japanese life insurance company has developed a system to calculate insurance premium payouts. In the world of architecture, the new concert hall in Hamburg was designed algorithmically, and yet one might think that only a human being with a remarkably refined sense of aesthetics could design such a building. Designers developed a system and gave it a relatively sparse set of criteria. They wanted the building to have specific acoustic properties and be made of specific materials. They set these criteria and the system generated a set of possible designs. The job of the architect was simply to look through those designs and choose one of them.

One of the professions that we looked at was divinity. One of the most playful and provocative of our case studies came from there. In 2011 the Catholic Church issued the first-ever digital imprimatur. This is the official license granted by the Catholic Church to religious texts – and they gave

it to an app, called Confession, that helps people prepare for confession. It has tools to help you track your sins. It also has a drop-down menu with various options for contrition for the faithful to choose from. It was incredibly controversial at the time, so controversial that the Vatican had to step in and say, “Look, while you are allowed to use this app to prepare for confession, remember that it is not a substitute for the real thing”. We found this quite revealing.

Our initial interest was in the impact that technology and artificial intelligence were having on the professions. We saw all these case studies showing the occurrence of remarkable change. The challenge was to identify the trends and the patterns. We identified eight high-level patterns and 30 granular trends underneath them. You can read about them in the book, as I cannot go into too much detail here. I do want to mention three, however, as I think that they are particularly interesting.

The first is what I call a move away from bespoke service. If you talk to many professionals, many will tell you that the work they do is a sort of bespoke activity. They see themselves as tailors crafting a suit from scratch or as artists starting each project with a blank sheet of paper. Many professionals traditionally view their work like that. Yet, there is an understanding that much work need not be treated in this bespoke, handicraft manner. We are also seeing an increasing decomposition of professional work. Many professionals have traditionally viewed their work as a sort of indivisible, monolithic lump that had to be handled by particular experts working at particular types of institutions. Increasingly, we are now seeing professional work broken down into all the different tasks and activities that make it up. Many of these different types of activity can be performed by different types of people, and many of them can be done without people at all. This is the final trend toward routinization of professional work. It turns out that a lot of the latter is relatively routine and can be automated accordingly.

This is just a taste of the trends that are taking place across the professions. And: everything that I have said so far is underpinned by technology. I would like to talk a little about technology in general before I talk about artificial intelligence. To do so, I want to set the scene by taking you back to 1996. That was the year when my co-author, Richard Susskind, wrote a book called *The Future of Law*. One of the main predictions that he made in that book was that the dominant way in which lawyers and clients would communicate in the future would be through electronic mail. This seems completely unremarkable today. At the time, 22 years ago, the Law Society (the professional association of lawyers in England and Wales) declared

that my father should not be allowed to speak in public. They said that he did not understand lawyer-client confidentiality, and in fact accused him of bringing the legal profession into disrepute by suggesting that the main way that lawyers and clients would communicate in the future would be by email. As I run through some emerging technologies, I want you to bear in mind the conservatism toward technology that you often encounter in professional settings.

How can we think clearly about technology with so much going on? We can look at it through four different lenses. The first is the extraordinary exponential growth in technology. Since the 1950s, every two or so years we have seen not only a doubling of processing power, but also a doubling of bandwidth and data storage capabilities. In that time, we have seen something like a one-to-ten-billion-fold reduction in the cost of performing computations. The raw technological power that we have at our disposal to build systems and machines is more vast than it has ever been. But the point is not that these systems and machines are simply more powerful; they are also more capable. We can use them to perform a wider range of tasks and activities. Third, these systems and machines are more pervasive. We all have tablets and smartphones, and our devices are becoming increasingly connected. The fourth trend is that we, too, are becoming increasingly connected through the various types of social media we are familiar with.

In our work we look in detail at all of these trends and what they mean. The most important thing is that there is no finishing line in the development of technology. Nobody is dusting their hands off, saying “job done”. When thinking about technologies 20 years from now it is important not to make judgments based on their existing capabilities.

That was technology in general. Let me now focus on artificial intelligence in particular. It is our topic today, and something that has really caught people’s imagination in the last few months. I have a story that has to do with the future of artificial intelligence and leadership. It begins at the time of what I call the “first wave” of artificial intelligence, in the 1980s, when my father was writing his thesis on artificial intelligence. Something interesting happened in 1986. A very difficult piece of law was passed in the United Kingdom called *The Latent Damage Act*. It turned out that a leading world expert on this particular piece of law at that time was the Dean of the Law School at Oxford where my father was doing his doctorate. The Dean came to my father and said words to the effect that “This is absurd. Whenever people want to know if this piece of law applies to them, they have to come to me. Why don’t we instead join forces and develop a system based on my expertise that these people can use instead of coming to me?”

And that is what they did. From 1986 to 1988 they developed an expert system, as it was known back then. They published it in the form of two floppy discs (the Internet did not yet exist). They also built a gigantic decision tree where people answered yes-or-know questions and navigated through the tree, which had two million branches built painstakingly by hand by my father and his colleagues.

Law was not the only field where they were doing this. They were also trying to build similar systems in medicine, taxation, and auditing. However, the approach in this first wave of artificial intelligence, in all these different domains, was the same. They thought that if you wanted to build a system that can perform a task, you had to identify a human expert, sit down with her, get her to explain how she would solve the problem, and then try to capture that human explanation in a set of instructions or rules (such as a giant decision tree) for a system to follow.

Back in the 1980s, my father and his colleagues thought that by our era these systems would be widespread. Actually, they are not. We see them in some places, but they are not as general as many people expected. Those of you who are familiar with the world of artificial intelligence know that toward the end of the 1980s, and as the 1990s began, a period known as the “AI winter” began. Funding, interest, and progress in artificial intelligence dried up.

The great turning point came in 1997, when Gary Kasparov, the world chess champion, was beaten by Deep Blue, a chess-playing system owned by IBM. It was a remarkable achievement. In the 1980s my father and his colleagues were some of the most open-minded people with regard to artificial intelligence. If you had asked them if this would ever be possible, they would have said emphatically “No”. Why? The reason is very important for the conversation that we are going to have this morning. At that time, they were in the first-wave mindset. They thought that the only way to build these systems was human-expert-based. But here was the problem. If you sat down with Gary Kasparov and said, “Gary, show me how good you are at chess”, he might be able to show you a few clever opening moves and some closing ones, but he would struggle to explain his game. He would talk about instinct, intuition, and gut reaction. He would not be able to articulate what makes him so good at chess; he would say that he just feels what a good move is. For that reason, my father and his colleagues thought that a task like playing chess could never be automated. If human beings cannot explain how they do something, how on Earth do we begin trying to write instructions for machines to follow? What they had not expected in the 1980s was the exponential growth in processing power that took place in the next few decades. By the time that Gary Kasparov sat down

with Deep Blue, that computer could calculate up to 330 million moves a second, whereas Kasparov could juggle only 110 moves in his head during any one turn. And that was 20 years ago.

Kasparov was beaten by brute-force processing power and lots of data storage capability. It did not matter that he could not explain how he played chess. Deep Blue was playing in a very different way. When we were doing our research, we had some correspondence with Patrick Winston, who was one of the founding fathers of artificial intelligence. He said, “There are lots of ways of being smart that are not being smart like us”. I think that this is a big challenge for professionals and leaders, because they often tend to think the opposite. They think that the only way to be smart is to be smart like them. This leads to one of the most important ideas in our work. We call it the artificial intelligence fallacy. It is the mistaken assumption that the only way to develop systems that can perform tasks at the level of human experts, or at higher levels, is to replicate the process of human thinking. This is simply not true. It was true 30 or 40 years ago, but not any more.

Let us consider judgment. Many experts will tell you that what they do requires judgment. That is supposed to be something that cannot be done by a machine, however capable. In light of what I have said, the question “Can a machine exercise judgment?” is probably the wrong question to ask. Instead, there are two others. The first is, “Why do people need the judgment of experts?” What problems does judgment solve? The answer to that lies in uncertainty. When the facts are unclear because the available information is ambiguous, people do not know what to do. They need the judgment of experts, based on experience, so that they can make sense of uncertainty.

And so the second question – the one we should really be occupying ourselves with – is not whether a machine can exercise judgment, but whether it can deal with uncertainty better than a human being. The answer to that question is “Of course”, in many cases. That is precisely what these machines are very good at doing. They can handle far larger bodies of data than human beings, and can make sense of them. An example is the system that I mentioned at the start. A photo of a freckle can be analyzed by a machine as accurately as leading dermatologists can analyze it. How does this system work? It does not try to copy the judgment of a human doctor. It understands nothing about medicine at all. Instead, it has a database of about 130,000 cases and it runs a pattern recognition algorithm through those cases, looking for similarities between those photos and the target image. This is an analysis of more cases than any human doctor can possibly make in a lifetime. It does not matter that a human doctor may not be

able to explain how exactly a patient is diagnosed – the machine is able to perform this task in a different way.

Or take another human faculty: creativity. Many people think that what they do requires creativity, and that is something that can never be emulated by a machine. Again, we have to ask: what problem does creativity solve? Why do we go to a fellow human being and say “We need a creative solution”? The answer to that question is that we need originality. By saying that we need something creative, we mean that we want something new and original. Creativity is the ability to take people by surprise.

There is a system that plays the board game Go. It is so complicated that it is said that there are more possible moves in it than there are atoms in the universe. Most experts in the field of artificial intelligence thought until recently that we were at least a decade away from being able to build a system that can play Go like a champion. They would say that chess is far simpler. It was possible to build a system that played like Kasparov, but there was no way to build a system that would beat the Kasparov of Go.

And yet, in 2016 that was precisely what the system did. It sat down with the then world Go champion and beat him four games to one. It was a remarkable achievement. What was most remarkable, though, was a particular move that the system played: the 37th move in the second game. I was watching the game live on YouTube. The Go board is divided into eight horizontal lines and eight vertical ones. There is a rule in Go forged by thousands of years of human tradition. It says, “Never put a piece on the fifth line from the edge”. And yet that is precisely what the machine did. The commentators were completely taken aback. They were speechless at what had happened. One champion later described the move as beautiful, whereas another said that it brought tears to his eyes. Everybody was stupefied. The system had selected a move that would probably have been called creative had it been played by a human being. Yet it feels wrong to call it creative because the system was not behaving creatively. It was performing a task that might require creativity from a human being, but it was approaching it in a fundamentally different way, using a lot of processing power and data storage capability. By the way, that 37th move has redefined the way that human beings play Go. They are now rethinking centuries of Go strategy.

Can machines think? It is an interesting question from a philosophical point of view, but from a more practical viewpoint it is not really the most important question. To see why, take a different system, called Watson, developed by IBM. Its claim to fame is that it went on the US quiz show “Jeopardy!” in 2011 and beat the two human Jeopardy! champions. The

system could answer questions on anything in the world more accurately than the humans. What I found particularly amusing is that the day after the system won, the *Wall Street Journal* ran a piece by the great American philosopher John Searle with the headline “Watson doesn’t know it won on Jeopardy!”. In a sense this is entirely true. Watson did not let out a cry of excitement after it won. It did not want to call its parents and say “Look at the great job that I have done.” It did not want to go down to the proverbial pub for a drink. It was not trying to reason or think like those human contestants. But that did not matter: it still managed to outperform them. It is what we call an increasingly capable non-thinking machine. And that is what the second wave of artificial intelligence is all about: now, machines are using lots of processing power, growing data storage capability and advances in algorithm design to perform tasks in fundamentally different ways than human beings.

It is often said that because machines may not be able to reason like human beings, they cannot exercise judgment; because they cannot feel like human beings, they cannot be empathetic; and because they cannot think like human beings, they cannot be creative. All these views may be completely right. But what they fail to recognize is that machines are increasingly capable of performing tasks that might require faculties like judgement, empathy, and creativity when performed by human beings, but perform them in very different ways to humans. As a result, a whole set of tasks and activities that many people thought were out of automation’s reach are now increasingly within reach.

What does this mean for the work that people do? And what does it mean for the future of work? One of the mistakes that we make when we talk about the future of work is that we tend to think about the different jobs that people do. We talk about lawyers, doctors, teachers, accountants, and so on. This is unhelpful because it encourages us to think of the jobs that people do as monolithic and indivisible. But if you look under the bonnet of any job, you will see that people perform a wide range of tasks and activities within that job. Why does this matter? I think that one of the mistakes that we make when we think about the future of work in terms of “jobs” rather than “tasks” is that we get trapped in the way that we think. We think that the only way that technological change can affect what people do is by displacing entire jobs in an instant. That is not how technology change affects work. It does something else: in a far more gradual way, it changes the tasks and activities involved in solving any particular problem.

A revealing study last year by McKinsey reviewed 820 occupations and found that less than five percent of them could be fully automated.

And yet, more than 60 percent of them involved tasks 30 percent of which could be automated. In short, it is very hard to find a job that can be fully automated, but almost all jobs have a fairly large component that can be.

What does this mean for the future of work? In the medium term, I do not expect mass unemployment. But I expect mass redeployment. Particularly in the professions, we can expect a serious change in the tasks and activities that people must do to solve all the different problems that, traditionally, the professions alone have solved. In our work we have identified 13 new roles that will become important in the future. I cannot go into all these in detail, but I will make two observations. First, many traditional professionals do not see these roles as part of their job descriptions. Secondly, many of these roles require skills and capabilities quite unlike the things that we train young people to do. I think that these observations present a challenge to the traditional professions. They beg the question as to whether traditional professionals will be best placed to do this work in the future.

So what does this mean for leadership? I think that the first challenge for leaders in the public and private sector is the education challenge. What are we training young people to become, and how can we retrain older people? I do not expect there to be no work in the medium term, but that work is going to change: people will require very different skills and capabilities. I think that through the 2020s people will be presented with two strategies. First, they can compete with machines by learning skills and capabilities that these systems and machines do not yet have. Despite all the remarkable things that I talked about this morning, there are lots of things that systems and machines cannot do. Second, people should be taught how to build machines. That distinction may sound relatively simple, yet we are not doing a good enough job in education.

Take competition. The OECD did a survey of adult skills around the globe last year. They compared literacy, numeracy, and problem-solving. They found that no education systems prepare the most adults to perform better than the level that computers are close to reproducing. Many of us recognize the need to teach people to do what systems and machines cannot do, and yet even today we are failing to do that most of the time.

Let us look at the other strategy: helping people to build machines. Take computer science. Today over half of the job postings of the top 25 percent of the highest-paid occupations in the United States require applicants to possess some kind of coding skill. The demand for people who can build machines is greater than it has ever been. And yet the OECD found that one in four adults had little or no experience of computers.

There is a second challenge for leaders. These new systems and machines are going to become increasingly prevalent in our lives. How do we ensure that they are transparent? One of the great merits of systems and machines in the first wave of artificial intelligence was that they were incredibly transparent because they were based on human reasoning. If you wanted to understand why that particular piece of law applied to you, it was easy. You just had to look at the decision tree and follow the reasoning. The great challenge with many of the new systems that rely instead on brute-force processing power, data storage capability and advances in algorithm design is that they are far more opaque and harder to understand, particularly with respect to the decisions that they reach. If these systems are becoming more prevalent in our lives and are opaque to those who use them, they present a great challenge for leaders trying to ensure that they are as transparent as possible so that people can feel comfortable using them and trust them.

There is a third challenge, for the professions. Who should own and control tomorrow's "practical expertise", and on what terms? Practical expertise is our term for the information, wisdom and know-how that professionals use to solve all the difficult problems they handle in society. When we began writing our book in 2010, our main preoccupation was the future of work. We wanted to understand what the future would be for lawyers, teachers, doctors and accountants. But we realized that there was a deeper question that we needed to grapple with: How do we distribute practical expertise in society? How do we make available to everyone the ability to solve all the difficult problems that they face? The traditional answer to this has been "through the professions": that is what the professions do. But now new technologies are allowing very different types of people and institutions to solve problems that were solved only by professionals in the past. The challenge is that these new institutions might misbehave. They might not be shaped by the same norms and standards of conduct as those that we expect from professionals. An example is the system that helps you prepare your tax declaration in the United States. A few years ago, the Internal Revenue Service of the United States announced their intention to simplify the tax process by providing citizens with pre-completed tax returns. Intuit, the company behind one popular tax return preparation software, fought that policy. It is reported that they spent millions of dollars lobbying to prevent government-provided tax returns. They said that they were against automated tax declarations because of concerns about accuracy and fairness. Whether or not they were correct, you can see that if new institutions with new commercial incentives take on work that has traditionally been handled by particular types of professional, shaped by particular codes of conduct, then there may be issues concerning the

regulation and governance of the conduct of these new institutions. It is becoming increasingly important for the leaders of the public sector to think about how we shape and constrain the behavior of these new institutions. This leads to another issue – the moral challenge.

I have spoken a lot today about what these systems and machines *could* do but I have not said anything about what they *should* do. There are now systems and machines in the US justice system that inform parole decisions. We might feel comfortable with that, but how would we feel with a system which issues life sentences? There are now systems that help make medical diagnoses, but how would we feel about a machine that decides whether to turn off a life support system even if it could make a more efficient decision than human beings about the allocation of finite hospital resources on the basis of the data that it has processed? Many people would rightly feel very uncomfortable with these possibilities.

I think that such examples show that many technologies raise troubling moral questions that we need to grapple with. One of the great challenges for leaders is not necessarily to ask a practical question, such as what these machines can do, but to ask a moral question, such as what they should do. There are areas of activity that we might want to protect from automation.

Finally, I want to finish on a point about mindset, for leaders and more generally. I think that mindset is very important. One of the lessons I have learned in studying the professions is that many professionals attach not only a strong sense of identity and purpose to the particular problems that they solve, but also to the way in which they solve them. Doctors like solving medical problems, and they also like the traditional craft of medicine. Lawyers like grappling with hard legal ambiguities, and they also like the traditional craft of law. Inevitably, this generates a lot of resistance to change because technology threatens the traditional way in which they solve their respective problems. The mindset that I encourage you to have when you try to think about the future is to be far more agnostic about the way in which problems might be solved in the future, and far less attached to how they were solved in the past, and instead focus on the problems themselves. These problems are not going to go away, but the ways in which they are solved are going to change quite dramatically.

Thank you very much. I look forward to hearing reflections and questions from the audience.

SANDI ČEŠKO

Your comment on the Go game was very interesting. I read in a paper that this is proof that the computer used intuition. How about that?

DANIEL SUSSKIND

"Intuition" is a word that is contaminated by the way in which it is used to refer to human capabilities, just like "creativity" or "judgment". Just as we would not call a carrot sad or a table angry, it feels wrong to call a machine intuitive. These are words that we ascribe to human thinking. While I think that it is wrong to say that the behavior of this machine is intuitive, I think that it is right to say that it is performing a task that might require intuition from a human being. Traditionally, we thought that we might not be able to build an "intuitive" machine. That is the wrong way to think. We are now able to build systems and machines that can perform tasks that might require intuition from a human being, but by performing those tasks in fundamentally different ways.

I do not think that it is right to use the word "intuition" in this case, just as I think that the word "artificial intelligence" is a misnomer. We ascribe intelligence to thinking human beings, whereas machines are not really "intelligent" in any meaningful sense at all. In the early days of artificial intelligence, there was a moment when they thought of calling the field "computational rationality". That is a less glamorous and exciting title than "artificial intelligence", but it is probably more accurate. It strips away the tendency to anthropomorphize these systems and machines by seeing them through our own eyes. I think that we should try to avoid using the language that we ascribe to human beings in reference to these machines. But that is not to say that these systems and machines are not sensationally capable. It is just that they perform their tasks in different ways.

ASTRID SHEIL

When will Oxford University hire the first computer as an assistant professor?

DANIEL SUSSKIND

The answer is "not for a very long time". The reason is this. One of the traps we fall into in thinking about the future of artificial intelligence is imagining that there is going to be a moment in the foreseeable future when an academic will turn up at work and see a machine sitting behind his desk. But my job in its entirety is not going to be replaced by a robot any time soon. Having said

that, it is true that lots of the individual tasks and activities that I carry out in my work, and that all academics do in their work, have been transformed by technology or can be done by technology. Recently, a robot was called to the British parliament to give evidence to a committee. It was a wonderful thing to do from the viewpoint of public relations. But it is just misleading because it gives a false sense of what technology does to work. Technological change does not displace people in their entirety from their jobs. That is not how it works. What we have to do in thinking what the future might look like is to think in terms of tasks and activities and ask what individual tasks and activities might be affected.

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FRANCI DEMŠAR

I followed the game between Kasparov and Deep Blue. I play chess a lot and I can tell you that it was a boring computer game. I also play Go but I am not good enough to see the beauty in the move that you described. These are examples of competition in games that have strict rules. Business also involves competition. Is it possible to create a system that would provide an advantage to a business company so that it can win?

DANIEL SUSSKIND

This is a really interesting question. It amounts to asking if there are domains, other than board games, that are particularly susceptible to automation. One of the limitations of many of these systems is that they are very effective but only for a particular task. Deep Blue could only play chess, for instance. And now there are machines that can play lots of different games. Any domain in which there is a relatively straightforward goal, and in which there are lots of data, are particularly susceptible to automation. These systems are given very few rules at all. Often they are just given some kind of utility function and then they are let loose to find whatever method maximizes that function. That is why, in the medical setting, there is no sense in which those systems are identifying new rules, at least not rules that can be articulated in the way that a human being articulates them: "If this, then that". The situation is far more ambiguous and complicated than that.

What is clear in a medical setting is a defined problem: Is this cancer or not? A setting in which it is relatively easy to define a goal and where it is relatively easy to see if success or failure is taking place, and there are data to learn from, is particularly susceptible to automation. That is why many of the people involved in developing these different game-playing machines moved into healthcare. They did not build these game-playing systems because they wanted them to be good

at board games; they wanted to solve other important problems. And some of the mechanics of the systems that are being used in a healthcare setting are quite similar to those that were developed in a board game setting. Domains where the goal can be defined clearly and it can be seen whether success or failure has been achieved, and where there are lots of data to learn from, are often ripe for these technologies.

MOJCA ZUPAN

Do you think that it is possible to create consciousness in a computer? Maybe 20 years from now your son will be standing here, telling the audience how his father was mistaken on this issue.

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DANIEL SUSSKIND

Or maybe there will be a machine telling me that I was mistaken. I think that this is a very interesting question. I do not know the answer. Although I am very interested in this issue, it is not my area of expertise. The point that I want to make about the problems that occupy us today is that this is not the question that we should be asking. It is fascinating and it is exciting to reflect on it but we do not need our systems and machines to be conscious for them to be very capable. Machines will change all of our lives and the institutions that we work in but I highly doubt they are going to think like us. Look at the history of artificial intelligence. Many computer scientists initially thought of themselves as cognitive scientists. They built these systems and machines because they wanted an insight into consciousness. They wanted to understand how the human mind works. I think that this is changing. People are now far more pragmatic, far more interested in making their machines merely capable.

MARKO MAJER

I would like to focus on the role of humans in future organizations. Managers are supposed to organize things, whereas leaders are supposed to stimulate and motivate. Artificial systems do not need stimulation and motivation. Does that mean that the role of a human leader is defunct?

DANIEL SUSSKIND

In other words, your thought is, "In a world of systems and machines, as more and more tasks and activities in an institution are taken over by artificial

intelligence, why do we need leaders since these systems do not need motivational inspiration?"

I think that it is a mistake to think that there are no people involved in this equation at all and that it is either people working in a traditional environment or these systems and machines in their place. Instead, what we are going to see are different types of people. Those systems, at the moment, cannot build themselves. They are designed, maintained, and used by particular types of worker. The challenge for leaders is to find out if these new people designing or using the systems are better led or motivated according to a different set of principles than those used in the past. I think that this question should be less about whether these systems and machines will cause a loss of the need for leadership. It should be more about the type of people involved in the building and maintenance of the systems and machines and the changing nature of leadership. Given the nature of the work that these people will be doing, should they be motivated in a different way? That, I think, is the challenge for the 2020s. In the future, we might think of a fully autonomous farm or factory. Then, the reflection that you made may be relevant. Generally speaking, however, the challenge is going to be changing the way that leaders lead human beings rather than the disappearance of leadership altogether.

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VISAR DOBROSHI

My question is about education for children. You touched upon education in your presentation but you spoke mainly about the professions. If artificial intelligence is something like analyzing data to provide the best scenarios, education will have to contain many new elements that we cannot imagine at the moment. Do you agree? Might we need a completely different type of education for children?

DANIEL SUSSKIND

I have an eight-month-old daughter and I think about this increasingly. How should I prepare her for the future that we have been talking about this morning? The general reflection that I made referred to two strategies. You either compete or you build. I think that this holds true at whatever age you are interested in. There are two sets of capabilities that technology is going to make more valuable. One is the things that these systems cannot do, such as various creative tasks or interpersonal tasks. The other one is the capability to design and operate these systems and machines. The answer to my question about my daughter's education depends on which of these two she is more interested in.

As I grew up, I was taught lots of foreign languages and today I speak all of them very badly. I wish I had spent those 10 or 15 years at school not learning modern languages, or Latin, but the language of computer science. That would have enabled me to think and talk comfortably in the language of digital systems. When you are learning a language you are not simply learning to talk to other people in that language. You are also learning the literature, culture, and history of other nations. The fascinating thing about computer science is that in the past 60 or 70 years a history and literature have developed that are not confined to national boundaries. Together they are also a way of thinking about the world that is fascinating and I want my daughter to learn about them.

The second issue that you touched on is flexibility. My parents' generation believed that once you got into a particular career, that was it. You just had to work hard enough to move through life. I think that work in the future is going to look far more unstable and uncertain. The skills and capabilities that will be valued will change and, almost certainly, that will happen in all sorts of unexpected ways. I think that being flexible and open-minded will be an important trait. One of the most important beliefs that we need to challenge is the idea that education is only for young people. You do it at the start of your life and you are done with it. Education is actually something that you have to return to at various points in your life.

Many young professionals throughout most of the 20th century thought that when they joined a financial firm or a medical practice, they would simply be passed a baton from the last generation, that what they would do in their career would look a lot like what their parents and grandparents did. Things look different now. Technology is redefining what those roles look like. What it means to be a doctor or a lawyer is changing, and further change can be expected in the years to come.

IZTOK SELJAK

First of all, I would like to point out that Slovenia is quite advanced in the use of digital technologies and artificial intelligence. At Hidria we have launched a digitally supported new combustion system that results in a 30-40 percent reduction in fuel consumption and emissions. We are bringing together 60 Slovene companies and universities to develop a digitally and artificial-intelligence-supported system of wireless induction so as to get rid of car batteries and cables. What we are lacking is recognition and support by the government and the public sector for these private initiatives. We need 30 million euros just for the first phase. As I listen to this debate today, I realize that we in Slovenia are incapable of understanding the potential and the multiplication effect of such

projects for our country. I wonder, therefore, if we need some sort of artificial intelligence to act as an intermediary between us and the government. It is a great business opportunity. So, if there is some sort of system for that purpose somewhere in the world we would like to apply it here.

DANIEL SUSSKIND

I agree that having a national strategy about these developments is important. That is why in the past 12-18 months almost every developed country in the world has announced some kind of artificial intelligence strategy. Some of them are very good, while others are less good. I think that the battle at the moment is between the United States and China. The reason is what you mentioned: the large amounts of money that are necessary to get sufficient processing power and the best software engineers. Some of these statistics ought to be more persuasive than any artificial intelligence system at the moment. We have to point out that there is currently a global artificial intelligence race on. The observation you made is well made. From a public policy point of view, having a coherent and realistic strategy with respect to these challenges is very important.

FRANK BARZ

I am interested in your view on the effect of artificial intelligence on our democracy. Do you see any impact?

DANIEL SUSSKIND

A really interesting question. Thinking about the role of technology has become a strange sort of family business for us. My father has spent the past four decades thinking about law and technology. But my brother is interested in political theory and technology. Recently he wrote a book called Future Politics. It answers exactly the question that you asked: What are the political consequences of these new technologies? One of the things that he argues has happened is that software engineers who design these systems and machines are increasingly becoming social engineers as well, because the new technologies are changing the ways in which we interact in society. They are changing the information that we receive, the nature of our political discourse, the way that we interact with traditional political institutions, and so on.

I think that the great challenge is that the technical capabilities that make these engineers very good at designing systems are quite unlikely to take into account the moral sensibility that is also required to think in a deep and careful

way about the political consequences of these technologies. Here is a very practical example. In philosophy there is something known as the “trolley problem”, which has implications for driverless cars. Imagine that a driverless car is hurtling down the road. Suddenly a man steps into the road. The car faces a decision. It can veer off the road and kill the driver, or plow on and kill the person on the road instead. Moral philosophers have debated and discussed problems like that. You can imagine future cars marketed according to what they would do in such cases. There may be altruistic cars (killing the driver), and selfish cars (preserving the life of the driver). You might even be able to choose your technology according to your ethical preferences.

But the point here is this. Before philosophers recognized the existence of an ethical problem here, these decisions were made by software engineers. In the early 2000s, when the initial code for those systems was being developed, cars were programmed to do something in this situation even though moral philosophers had not debated these issues. A software engineer had, perhaps unwittingly, become a social engineer.

Why am I talking about this? Because the sense of moral responsibility that is required to reason in a careful way about what the car should do in that situation is very different from the technical capabilities that are required to build that system in the first place. We are not only talking about consequences for democracy. These technologies have far broader consequences. Technology companies have to recognize that their technologies have not only commercial consequences, but also social and political ones. They have to understand that these technologies have a political, social, and moral influence. Consumers need to be aware of these issues, too. I joke about marketing on the basis of people’s ethical preferences, but seriously, consumers need to start thinking about these technologies not in the way that we think about buying a bottle of water or a sandwich. We have to think far more deeply and carefully about the moral and political consequences that these technologies have.

BORIS TRUPČEVIĆ

I originally had one question, but now I have two. I would like to hear your take on China’s social credit system. China monitors and records everything that its citizens do: how late you are on your payments, whether you ignore red traffic lights as a pedestrian, who your friends are, and so forth. All this is recorded and then an algorithm gives you a score. If you are a good citizen, you get benefits. If you have a low score, you get punished. For example, you may not be allowed to travel to another province.

I would also like you to talk more about transhumanism. Today, we are talking about human beings on one side and machines and artificial intelligence on the other side. However, there are colleagues of yours who are doing practical work on transhumanism. In a number of successful experiments, humans have been connected to machines. Human beings have exchanged thoughts over the Internet and across the Atlantic Ocean. This is inevitably the next thing that is coming up. We will not be talking about humans and machines but human machines.

DANIEL SUSSKIND

These are very interesting questions. Let me first share my reflections on the social credit system in China. I have two observations about it. The first is that one of the political responses to the rise of the large technology companies is to say that they are much like utility companies. They provide public goods in some sense, and therefore we ought to nationalize them. I think that the example of China is a good reason to stop that idea dead in its tracks, alongside the other reasons why it is a bad idea. There is no reason to anticipate that when these technologies are in the hands of the state, rather than in the hands of private companies, they will necessarily be used in a more benevolent way. This provides an interesting counter to an argument that comes from the political left: that we need to think about nationalizing these large technology companies.

The second observation I make is about speed of travel. One of the questions that I often get asked is who is going to develop these technologies first. The speed of travel depends on a set of different things. It depends on the type of commercial environment: on companies' ability and ambition to develop these technologies. It partly depends on consumers: how willing they are to use these technologies. But it also depends directly on the state: the regulatory framework that it has in place. For example, if you want to develop a driverless car, how much testing do you have to do before you are allowed to show that it is as safe or safer than a traditional car to be allowed to launch it? There is also a cultural environment that needs to be considered. Interestingly, in the last three months it became clear to Google employees that Google had signed a contract with the Pentagon to use their technology to develop some kind of system. This triggered a huge protest, and in the end that contract was abandoned. The protesters within the company prevailed. The social credit example provides a great insight into how these cultural concerns are likely to have far less influence in China. If the state decides that it wants to implement a system like that, it is going to implement it. At least, it is going to be far easier for it to do so than in America or Western Europe, where it would face more cultural and political resistance.

These systems rely on a huge amount of data. There was a lot of controversy in the United Kingdom in the last few months after it became clear that some systems are being used without the consent of the people whose data were captured. Concerns of this kind are unlikely to be influential in China. We may find the idea of a social credit system politically unpalatable, but this is one of the reasons why these technologies may be developed more swiftly there. This is a challenge for our policymakers. Given what we think about liberty, privacy, and democracy, how do we compete with countries that are not constrained by similar concerns? The permissiveness of China in this respect is one of the challenges for us in trying to keep up in this race.

Transhumanism is a really interesting question. I think that in the medium term, in the 2020s, the real challenge is not bionic but medical: using chemicals to improve mental concentration. The ethical and moral challenges around that seem huge to me. I think that we are still some way from digital enhancement of our cognitive capabilities but chemical enhancement is very much an existing challenge.

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RICCARDO ILLY

I have two short questions. Your definition of creativity is that it is an original selection from among existing choices. We normally think of creativity as the capability to invent new choices. Do you think that artificial intelligence will be able to create new choices?

Second, I listened to a presentation on artificial intelligence a few weeks ago. The last thing that the speaker said was that we can expect artificial intelligence to do many things except provide common sense. Do you agree?

DANIEL SUSSKIND

What did the speaker mean by “common sense”?

RICCARDO ILLY

He gave some examples, such as making decisions on some very simple questions that do not involve technical issues.

DANIEL SUSSKIND

The question of whether artificial intelligence can create new choices is fascinating. The short answer is “yes”. There is a field known as “computational

creativity". Researchers in that field are trying to do precisely what you are talking about. The interesting question is whether we will value those products of machine creativity in the way that we value products of human creativity. One of the anecdotes that we have in the book is about coffee and leading restaurants in the United Kingdom. It is said that some of them use Nespresso coffee capsules. And even though in blind tests people can find these capsules as delicious as other types of coffee, customers are often outraged. They wanted the coffee to be crafted by a human being, to be prepared by a barista in a traditional way, not churned out of a machine. What many people value in a cup of coffee is not only how it tastes but also how it is made. They feel let down when they found out that it was capsule coffee, even though it was delicious.

I think that there is a lesson for creativity in that. When we walk into the Sistine Chapel and we look at the ceiling, we say, "That is beautiful, and isn't it amazing that a human being created it?" Einstein's theory of relativity is fascinating because it teaches us something about the world, but we also value it because it was created by an extraordinary human being. We often value things not only for the outcome they secure, but also for the way in which these outcomes were achieved.

I think that the question of creativity raises some interesting issues. I think that there are many areas of life where even if machines behave in very original or novel ways, we may not value their output because we tend to prefer the creativity of human beings, particularly in an artistic setting.

The common-sense issue is fascinating. It points to a parallel in robotics where an interesting paradox has been noted – many of the things that we find simple to do are very hard for machines to do. Examples are cutting hair, trimming a shrub, and cleaning a house. These tasks are remarkably difficult for machines. There is an important point here. The assumption that we often make is that the level of education required for a human being to do something is indicative of how hard a machine will find it. This is wrong.

The general point is that systems and machines do not find difficult what we find difficult. Looking at the level of education required by a human being to do something is not always a good indicator of whether or not it can be automated. Thus there will be many commonsensical things that human beings find commonsensical, yet are very difficult to automate. Conversely, many of the things that demand some of our highest faculties, such as playing Go, are easy for systems and machines.

PAUL CLAUDEL

Thank you very much.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON LEADERSHIP IN THE BUSINESS AND SOCIAL ENVIRONMENT

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Discussion with Business and Academic Leaders

PAUL CLAUDEL

Ladies and gentlemen, we are beginning the second part of this session. We will ask you to contribute to it by discussing topics that we will propose to you. Then, you can ask questions of the panelists.

PIERRE CASSE

Our main topic is the impact of artificial intelligence on business and the social environment. The definition of business that we are going to use is “the process by which we invent, produce, distribute, sell, goods, services and in the meantime create wealth”. After you have discussed this topic, I will collect some reactions from you and then we will ask the panel to give us their reactions to your comments or questions.

MIRJANA PERKO

In our group, we discussed a third scenario for the future. We discussed a situation in which two computers talk to each other and develop a language of their own that humans do not understand. In that way, they achieve independence and we can no longer control them. Can artificial intelligence get out of control and create a science fiction scenario?

We also discussed current world problems, such as global warming, and wondered if computers could solve them.

We also talked about politicians like Trump who defy common sense and logic. How can we deal with them?

PIERRE CASSE

Fine. Let us get some reactions from the panel.

FRANK BARZ

If I understand your question properly, you asked whether artificial intelligence can solve the problem of global warming. And you asked if it can help us deal with politicians. I would say that we are probably far away from solving the complex system of global warming, as it has already had a great impact on the environment and society. We must reverse our current situation as soon as possible. As for AI, we have to look at all the different parameters which have an impact on global warming, and must deal with each of them separately. For the moment, humans still have the biggest influence on stopping or reversing climate change.

DANIEL SUSSKIND

To answer the question about global warming, you have to look at each of the drivers of climate change. Might new technologies lead to methods of production that are less damaging? A single technology would not solve the problem in an instant. Driverless cars are an interesting example. Manufacturers talk about commercial vehicles within the coming years. That is pure speculation. The answer would require looking at each of these domains and asking if technology can provide a solution. Unless that is specifically what we want technology to do, I do not think that it should be expected to provide solutions to the problem.

PIERRE CASSE

But is it possible that two computers can start talking to each other without any human impulse and use a language that no human can understand?

DANIEL SUSSKIND

No, it is not. That is a misrepresentation. It is interesting because it points to a general problem concerning artificial intelligence. There are various things that people like Steven Hawking and Bill Gates have said about “superintelligence”.



They are very exciting and very interesting from a philosophical viewpoint. But in my view they are essentially a distraction. Many of the technologies that are likely to change our lives are far less profound than such conscious machines. The current systems are very capable, but they are entirely unthinking. And yet, they can have serious consequences if we set them up wrong. Already there are systems that appear at first glance to make parole decisions which discriminate against a particular race, and systems that make employment decisions which discriminate against a particular gender. In my view, these are the sorts of problems that we need to be thinking about: how to avoid risks associated with unthinking and unconscious systems seems to be the problem that we need to be discussing. Talking about superintelligent machines that talk to each other and invent a new language of their own distracts us quite a bit from that.

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PAUL CLAUDEL

I think that we are making a mistake by thinking in linear terms. We tend to think how things will look 100 years from now. But everything is accelerating so rapidly that what seems 100 years away may actually be 10 years away. Everything is developing much faster than we can even imagine. Let us remember that when talking about what might happen or not. Daniel, do you agree with that?

DANIEL SUSSKIND

It is very hard to think exponentially. Since 1950, processing power has doubled every two years or so. On the face of it that sounds quite impressive, but to really appreciate how impressive that is is quite difficult. Think of the story of the king and a princess. A princess is in turmoil and she is rescued by a tramp. He returns her to the king and the king says, "Thank you so much for saving my daughter. How can I ever repay you?" Now, the tramp is mathematically astute.

He says, “I want you to get a chessboard. I want you to put a grain of rice on the first square. Then, you put two on the second and four on the third. You double the number of grains of rice on each next square. All I want is the pile of rice that will accumulate on the board.”. The king is not mathematically astute and thinks that he has struck a good bargain with the tramp. He calls his servants and asks them to start gathering grains of rice. Quickly, they realize that this is an impossible task. To complete it, you need more rice than is produced each year on planet Earth. And that is only 64 doublings. The question is whether this can continue as fast as before, and we can talk a little bit about that if you wish. We think very well in linear terms, but we struggle to think exponentially.

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ALI PANDIR

If artificial intelligence becomes available to all companies in the future, how will they differentiate themselves?

PIERRE CASSE

This is a very interesting question. If everybody uses the same machines for diagnosing problems and making decisions, how will companies differentiate themselves in the future?

DANIEL SUSSKIND

I think that what will distinguish companies in a world where rival systems clash are three things. The first is the amount of processing power that they have. The second is the amount of data they have. And the third is what their engineers are like, and how talented they are. Each of these three provides opportunities for competitive advantage. And the place where they are most notable are large technology companies, which have lots of processing power and data-storage capability, as well as very talented engineers. What will distinguish one company from another is what they have in each of these three dimensions. It is a mistake to think that if everybody has a system or a machine, they are on a level playing-field. Those who have the best systems will be better off than those who do not.

PIERRE CASSE

Are you suggesting that those who have the money to buy sophisticated technologies (algorithms) will outperform everybody else?

DANIEL SUSSKIND

One of my expectations is that we are moving toward a world with a few very large and very powerful technology companies. The economics of these systems points toward this being the most effective way of organizing in order to develop the most effective systems.

NICHOLAS ZHANG

Personalized needs maybe give the answer. In the future, we will not be able to provide the same solution to everybody. Imagine that some people want to buy shoes. They do not want to buy the same size of shoes. As customers will continue to expect variety, there will be no need for the same answer to the same problem. The diversity will lead to the big market. That will provide more jobs in different other areas.

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FRANK BARZ

I fully agree about the importance of processing power, data availability, and good engineers. But since most of you work for companies, ask yourselves why your company is doing what it is doing, and look closer at the purpose of your business: "why you are doing what you are doing". I am thinking of the culture change that needs to be adopted at the top of AI Systems. I am glad to be student at IEDC, because it teaches how we can differentiate ourselves through values and business ethics. I agree that change is not linear. Some things seem far away, but there are also other issues to solve, and please do not focus on pure technology – get the humans into clear communication about your AI systems.

PIERRE CASSE

As we are in a business school, let us think of the impact on education. Do you agree that in the future we might have a case study of a problem with a potential solution, and - after we press a button - a machine tells us that we are wrong and saying: "Here is the right diagnoses and these are my recommendations". What do you think? Yes or no?

DANIEL SUSSKIND

This question was asked before, and I said that it is interesting that some companies are already trying to develop systems that do that. In our book, I describe an early system that is meant to be an advisor to board members. It

sits in on meetings and analyzes what has been spoken about. There are great aspirations concerning that technology. That is what people have in mind. For me, the most exciting role for technology in a classroom lies in what is known as "personalized learning systems". One of the great merits of the Oxford system where I teach is the tutorial system. I sit with a group of two or three students and talk to them about their particular interests and concerns. We know from evidence that people taught in a one-to-one tuition setting tend to outperform peers taught in a traditional classroom setting. The problem is that one-to-one tuition with a human being is incredibly expensive. Personalized systems tailor what is taught and the pace at which it is taught to particular students, much like one-to-one tuition, but at lower cost. I think that this is quite exciting.

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PIERRE CASSE

Do you also foresee judges making decisions based on what computers tell them?

DANIEL SUSSKIND

It is important to first break down the role of a judge into all the different tasks and activities that make it up. And yes, an increasing number of these tasks can be performed by machines. But machines cannot do everything that judges do, nor would we necessarily want them to even if they could.

PAUL CLAUDEL

It is time to move on to the next topic. As Pierre reminded us, this is a business school and many of you in this room are involved in business, either leading or being led. Our next topic is leadership. The format will be the same. The question is how artificial intelligence affects the practice of leadership. What should leaders do to prepare people for the artificial intelligence age? And can we safely ignore the emergence of artificial intelligence as some people are doing? What will be the consequences of that?

FRANK BARZ

In Europe, we all come from relatively small countries and cannot compete with giants like the United States and China on data platforms used in the B2C segment. Therefore, we should not try to build another Google or Facebook. In our market other aspects are important, such as data privacy and security. Since we started this discussion, there have been 10,000 attempts to hack our IT systems.

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Our customers want the benefits of data privacy and IT security. Therefore, we have to educate our employees about data privacy and security, and always see things from the perspective of our customers. We need not compete against the big data platforms, but instead should find our own ways, mostly in the B2B segment.

DANIEL SUSSKIND

I think that we are moving toward a world that is dominated by a small number of large technology companies, and this is a big challenge for smaller companies for the reasons that I have discussed. One potential strategy is to collaborate far more than in the past. The governing philosophy in business is to compete and beat your competitors, but given the nature of these technologies I think that we have a compelling case for far greater collaboration among small businesses. If they pool their resources, they can be stronger than they are individually. It is a spirit that is not traditionally maintained in the corporate world. In other settings – the public sector and academia – collaboration is common. I think that there is room for collaboration among small companies, but there is no easy solution.

NICHOLAS ZHANG

In digital economies, the big companies have more advantages than small ones. I agree that competing with big companies is not a solution for small companies. They should provide something different instead of competing. In some vertical areas, small company have the more capabilities of profit than big company.

FRANK BARZ

I run an incubator program with 200 start-ups. Collaboration and information-sharing is essential for them to survive. They make huge efforts to work together in a team. With successful start-ups I see that when that happens, the result is measurable in market success.

DANIEL SUSSKIND

My sense is that building this atmosphere in an emergent group of start-ups is easier than among a group of established companies.

ANDREJ URBANČ

I think that it is becoming impossible for leaders to ignore the consequences of artificial intelligence. Leadership has always involved leading people. Now it involves leading both people and technologies. This means that new leaders will need to understand the dynamics in a team and how people should be motivated, but they must also ensure smooth collaboration between people and machines to obtain competitive advantage in their fields.

You talked about competing with technology or building it. Isn't there a third strategy: collaboration?

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DANIEL SUSSKIND

I suppose that when we talk about cooperation and competition, we are talking about the same task. These are activities that systems and machines make more valuable. I have deliberately chosen the word "compete" though, because today machines make human beings more valuable, but at tasks at which they may replace them tomorrow.

Take driving a car. Today satellite navigation systems complement human beings. A human being, aided by one of these systems, can navigate more roads than when acting alone. But in the future, when we have driverless cars, these systems will help the machine instead. I used the word "compete" deliberately, because there is a real sense in which these activities, where human beings and machine work well together, might be done in the future by machines alone. So I think that we have to be alive to the possibility that the set of things in which people and machines cooperate may get smaller over time.

You said that most companies recognize now that this is a challenge. I think that you are absolutely right. But I also think that many companies turn to their marketing departments for their technology strategies. Many companies do not yet really take them seriously.

FRANK BARZ

How many companies do you know who have an appropriate artificial intelligence strategy? Hands up – I see only 2-3 in the room..

DANIEL SUSSKIND

This is also true of the public sector. Many governments have designed

artificial intelligence strategies but they are talking the talk without walking the walk. They are not delivering on the various ambitions and intentions that they have. I think that is problematic.

PAUL CLAUDEL

So, the social form of cooperation can be replaced by cooperation between machines?

DANIEL SUSSKIND

I used the word “compete” deliberately because we must not be complacent about the fact that although people are better than machines today at certain tasks, they may not continue to be better in the future at those tasks. I want people to realize that the current tasks and activities they perform will not offer them indefinite safe refuge.

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PAUL CLAUDEL

Before we move to the next topic, I have a naive question for Daniel. If we ask an artificial intelligence system what kind of system we should have and how we should prepare ourselves for the future, what kind of answer will we get, if any at all?

DANIEL SUSSKIND

A very bad one. At the moment, these systems are very competent at very particular tasks. If you move outside of their domain, they cannot function. But I think that it is a mistake to think that they are less capable as a result. The answer to your question is that you will not get an answer because no system has been designed for that purpose.

PAUL CLAUDEL

There are machines that can take over parts of the jobs of financial experts, accountants, and judges. Do you think that they can take over some of the functions of leaders?

DANIEL SUSSKIND

There are systems that, it is said, can predict the outcome of patent disputes as accurately as leading patent lawyers. Look at the first 10 years of what a junior lawyer does: document retrieval, document review, and document assembly. These are activities that systems and machines can do very well. Maybe there are also aspects of what it means to be a leader that we can design systems and machines to do.

PAUL CLAUDEL

Let us move on. Can you all project yourselves 20 years into the future? Think of the difference between human intelligence and artificial intelligence. What will it mean to be a human being 20 years from now? What will be the impact of artificial intelligence on the way that your brain works?

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TADEJ PETEK

Twenty years ago, it was assumed that robots would now be doing most of our housework. Today, the best-performing machine is a vacuum cleaner (if it performs properly in the first place). The so-called non-linear development of artificial intelligence has clearly not taken place over the past two decades, at least not in business-to-client markets. I do not believe that our thinking is going to become any different.

DANIEL SUSSKIND

This refers to what I said previously. Lots of housekeeping activities that may seem relatively simple to human beings are very hard for machines. This has to do with the paradox that many of the things that we find the simplest to do are the hardest for machines.

My second observation is that there are two sides to the automation equation. One is how productive a system is. There is a machine that can fold laundry. You can watch it on YouTube. It is quite amusing. But it is also hugely expensive. Why would you buy one when the commercial incentive simply is not there? Conversely, think about professional work. There is a quite strong commercial incentive to reduce the number of junior lawyers reviewing documents. In a strange way, many of the simplest things that we do in a household will not be automated for that reason. Perhaps a lot of the work in the developing world can be automated, but because labor costs are so low this will probably not happen for some time. You have to think about productivity and cost at the same time.

Second, I think that “artificial intelligence” is a misnomer. These systems and machines do not behave intelligently in the way that we behave intelligently. And still they are incredibly capable. If we get trapped into thinking in terms of intelligence, we might (as many people in computer science and economics have done) underestimate the capabilities of these machines. They are unthinking but they are still very capable.

FRANK BARZ

I think that we do not have to digitalize everything, like arts and music. We have to leave some things as they are, and just enjoy them as they are. Digitalization might not solve all problems, but it is a perfect assistant.

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PIERRE CASSE

I disagree. Wouldn’t it be nice to return home at the end of a heavy day and be able to talk to the walls and say “I want the temperature to be a little higher, please, and I want a bit more light”. And then you would ask for some classical music. Wouldn’t that be fun?

DANIEL SUSSKIND

At our house, we have turned off that system. We have security concerns. I read that somewhere in the United States a murder took place and the only witness was the automated system in the room. The court asked Amazon to release the system’s transcript. Amazon refused, but I am still worried that the system was capable of recording conversations that were not meant for it. I am also concerned about the moral, political, and social consequences that these technologies can have. They are more significant than the technical ones.

ARNOLD WALRAVENS

Computers may displace us in many fields, but I think that we will still have an important function in the future. For example, we will need what I call artful intelligence as well as emotional intelligence. In 20 years, most of us will probably be vegetarians. We will live close to our neighbors, with our computers, and will not travel like crazy around the world. In 20 years the world will look less interesting, as everything will be the same. Every town will have the same appearance. Next time when I visit Beijing, I will have to ask where Chinatown isbecause there will not be anything that will look like it and nobody will be able to find it.



NICHOLAS ZHANG

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The technologies also can make life more interesting. As my parents grew up without computers and did not know how to use one. But I bought them one smart speaker last year and now they can watch movies and surf the Internet. They feel they are not lonely anymore. They also feel powerful. They can buy goods through smart speaker. That makes them very happy. It works well for them.

PIERRE CASSE

Daniel, don't you think that the critical thing is that artificial intelligence, as it exists today, has a strong impact on the way that the human brain works?

DANIEL SUSSKIND

In what sense?

PIERRE CASSE

Let me give you an example. Is there anybody in the room who has experienced this? You go into a room and you wonder "Why am I here?" The human brain does not (already) need that kind of memory anymore because it can be handled by artificial intelligence. What is your thought on that?

DANIEL SUSSKIND

One of the best books that I have read in the past few years is about the US memory championship. Its participants tell the author that there is nothing special in what they do, that everyone can be trained to have a fantastic memory.

He does not believe it, but he asks them to show him how. They do so, and the author comes back the following year and wins the championship. Afterwards this author wrote a book called Moonwalking with Einstein. It is partly a story about the above, but it is also a history of memory. In classical times there were great orators who could stand up without a script and speak for hours. He talks about remembering things spatially, the idea being that we need to build "memory palaces". The reason that I brought this up is that his book contains conversations that remind me of what you talked about: whether or not technology is having a harmful impact on a faculty like memory.

What is quite interesting about the work that is being done at the moment is that there is more and more investigation into the psychological impact of these technologies, not only on memory but also on mood, depression, and anxiety, on how we interact with each other, and on sociability. It is all very fascinating. There are some technologies that I do not use anymore as I think that they have harmful psychological effects. I think that this is a general thing. These are still early days and more work needs to be done. But I think we can disagree with the argument that technology is making us more stupid. Technology is allowing us to do things that we would have never been able to do on our own in the past. It is important to keep that in mind.

PAUL CLAUDEL

It is time for conclusions. Let us ask the panelists to reflect briefly on what they have heard today. Let us have them share their recommendations, if they have any.

NICHOLAS ZHANG

I think that the speakers and the audience shared some very good ideas with us. We have met big challenges ahead of us as well as big opportunities for business and education.

At first, we have to embrace digitalization and work together in order to achieve progress.

Secondly I would also add that in the future we will need more personalized products and services. That will provide more jobs and work opportunities to us. People will not bear the same size shoes, the same cars, and the same medicine to everybody. Sometimes it means boring, but mostly that will do harm to us. For example everyone take the same medicine as they were sick. We have to improve life for everybody. With improved healthcare, it will be possible to have people

live as long as 200 years, although they currently live no more than 100 years. We still have a very long way to go.

Thirdly, at the moment, artificial intelligence is just a black box. We are trying to make it predictable and explainable but we have not achieved enough in that respect. We need more researches in this area.

Finally artificial intelligence creates big challenges and opportunities for education. Some simple professions are replaced by machine, and we need to learn new skill to fit it. Currently, we teach classes for dozens of students. That does not work very well. If we want to improve education, we have to set up a personalized system for each student that AI can help. Also, we need to ensure life-long learning for all human beings. For that purpose, we need new generations of learning systems to improve learning efficiency for human.

FRANK BARZ

Artificial intelligence will change our lives much faster than the Internet. It is everywhere already. Today we discussed ethical guidelines. Number one is responsibility. Somebody needs to be responsible for artificial intelligence systems. And we need to know the location of artificial intelligence. It should not be a black box. Somebody must assume responsibility. Number two is control of these systems. Human beings should be able to interfere at any time. It is leaders who must have control functions, not machines. Number three is to use artificial intelligence only when it makes sense. Use it when you can do something useful for your customers or your students. Always try to put yourself in the shoes of your customer. I also recommend transparency. The next issue is security. How safe are your data? I do not want anybody to be able to clone artificial intelligence and tinker with it. Finally, share your knowledge. Educate your people. If all these conditions are met, artificial intelligence will be fun because it will make our lives better.

DANIEL SUSSKIND

I want to make three observations. One of the things that we get trapped in when we speak about technology and technological progress is that we tend to wonder what this means for the work that we do. But there are also huge consequences for consumers. We spend a lot of time thinking about what artificial intelligence means for doctors, lawyers, and teachers, but what does it mean for patients, students, clients, and all sorts of other recipients of this work? In fact, it was the consumer viewpoint that got me interested in this set of challenges in the first place. As I said right at the start of my talk, not enough people have

access to a good education or healthcare system, and few have enough knowledge of their legal entitlements. The promise of technological change which might threaten providers is very exciting for consumers. It is a promise of affordable access to things that might not have been affordable before. So we must not forget the implications of artificial intelligence for consumers. When we talk about the future of work, we must also talk about collective prosperity for our society.

I have two final thoughts on leadership. I would encourage you again to think in terms of tasks, not in terms of jobs. As a leader, think about the consequences of technological change for the tasks that you do in your work, as well the consequences for the tasks that make up the work of the people that you lead. Again, I think that it is unhelpful to ask whether artificial intelligence means an end to leadership. Instead, focus on the tasks that you perform and those of the people that you lead. That would be far more revealing and useful.

I am sometimes accused of being a technological determinist. Actually, there is a huge amount of uncertainty about how the future will look. We do not know exactly what work will look like, or what skills and capabilities will be important. Some general trends are discernible but there is still a lot of uncertainty. I think that leadership in the future will be more important than it is today. It is important to discuss current issues, but a whole set of new questions will emerge. We will need our leaders to help us navigate them.

PAUL CLAUDEL

Thank you very much.

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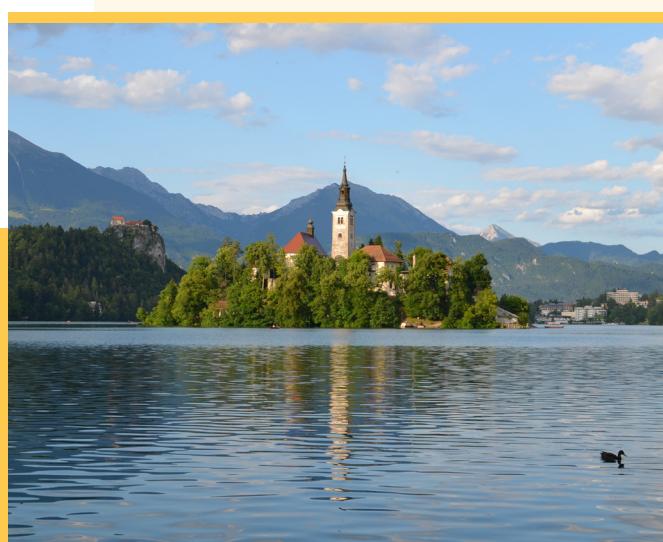


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