

Artificial intelligence in business: Separating the real from the hype

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The potential for AI to infuse business and value chains across various industries is greater than ever before — but where should executives start?

Typically understood as being all about robots and whiz-bang machines, artificial intelligence (AI) can be tough for executives to wrap their business minds around. In this episode of the *McKinsey Podcast*, senior partner Peter Breuer and McKinsey Global Institute partner Michael Chui speak with McKinsey Publishing's Simon London about burgeoning business applications of artificial intelligence, the line between hype and true use cases for AI, and how business leaders can separate one from the other.

Podcast transcript

Simon London: Hello and welcome to the *McKinsey Podcast*. I'm Simon London with McKinsey Publishing. Today, we're going to be talking about artificial intelligence. It's certainly a hot topic in the business press and also starting to attract quite a lot of attention in the mainstream media.

You've probably read pieces about everything from killer robots to the impact of AI on jobs. But what exactly is artificial intelligence? Just as important, what isn't it? How can companies put artificial intelligence to work today in ways that are useful?

I'm joined today by two McKinsey partners who advise clients and conduct research on these issues. I notice they also have PhDs in adjacent fields, so as a liberal arts major, I'm finding this somewhat intimidating. First we have Peter Breuer, a senior partner based in Cologne, in Germany. Hello, Peter.

Peter Breuer: Hello.

Simon London: And we have Michael Chui, a partner with the McKinsey Global Institute, based in San Francisco. Hello, Michael.

Michael Chui: Hi, Simon. Pleasure to be with you today.

Simon London: Good. Let's start, if you don't mind, by defining our terms. When we talk about artificial intelligence, or AI, what do we mean? Michael, why don't you just give us your view.

Michael Chui: It's interesting, this term is actually not a new term. It was first used over half a century ago. But basically it refers to using machines to do things that we consider to be in quotes "intelligent"—being able to either simulate or do things that we describe people as doing with their cognitive faculties.

Simon London: Peter, anything you'd like to add to that?

Peter Breuer: As Michael pointed out, the term was invented by Alan Turing in 1950. So it's actually, I would say, a pretty well-known field. We have seen a little bit of an acceleration lately because of two main factors.

Number one, the computational power is going upward. Exponential growth. And, number two, the available data is going upward. Exponential growth. Therefore you'll see methodologies around machine learning and now going even deeper into deep learning with new neural networks that are applied to those vast amounts of data. So that you see, to some extent, the exponential growth in data, in computational power, leads now to the AI hype or AI development.

Simon London: Michael, in a report that we published this summer, a McKinsey Global Institute report, we talked about there being five technology systems of which machine learning is just part of it. Did you want to run us quickly through what those five are?

Michael Chui: Earlier this year we surveyed over 3,000 different business executives around the world to understand the degree to which they were deploying these types of technologies. They're broad families of technologies, and they overlap a bit, but they are where some of the recent advancements and developments have been happening.

One of them is around physical AI, and so that's robotics and autonomous vehicles. We're seeing a lot of interesting things happen there. Second, computer vision—whether it's image processing, video processing, et cetera—the deep-learning systems that Peter made reference to have made a lot of advancements there.

Similarly, around natural-language processing, whether it's spoken language particularly, which is interesting, but also written language, we're seeing a lot of natural-language work being done. Also, virtual agents or conversational interfaces. It's a bit of an extension on natural language, which is more of a feature, but this is the ability for systems to roughly converse with you whether by voice or online through chats.

Finally, machine learning actually has tremendous applicability beyond the application of the other types of technologies I just mentioned. And hopefully we'll have an opportunity to talk more about that.

Simon London: Great. That's really helpful. At least we know the territory we're dealing with here. Maybe we can bring it even closer to reality with, as I go about my daily life, I suspect I'm

already running into artificial intelligence in action. Are there things, Peter, that you see in your daily life that people will recognize are powered by AI?

Peter Breuer: I think we all do, actually. With our smartphones, we all have supercomputers at our fingertips. Some of the elements that Michael mentioned, you can experience in your daily life. The improved spell-checks that you have when you're typing an email or a message in your smartphone, this is all powered by machine learning.

Michael also mentioned language, the spoken word. You will notice that your Siri or Google Assistant learns every day, and the understanding becomes better every day the more you use it. That's obviously machine learning in the background.

Most of us followed the exciting introduction of the new iPhone X, and there you also saw in the press conference, it's all about machine learning now for face recognition, applied also, machine learning in face recognition to unlock your phone. So, I think we all experience it already with our smartphones, and going forward, we'll see much more of it.

Michael Chui: What we're starting to see is these AI technologies underpinning a lot of the things, all the online and mobile services that we're now increasingly taking advantage of. So, for instance, in e-commerce or media, when systems are providing you with suggestions for things you might be interested in, things you might be interested in reading or things you might be interested in buying—the next-product-to-buy use case, as we describe it—increasingly, those types of systems are powered not only by statistical methods, but by some of these AI technologies as well, hopefully bringing consumers closer to the things that they'd be most interested in.

Simon London: I'm going to throw one more into the pot there. I'm lucky enough to live in the city of Mountain View in Silicon Valley. There are a surprising number of self-driving cars out on the road. They're training. They're collecting data. These aren't things you can yet buy. But I don't think there's a day goes past where on my morning commute in and out of the office, I don't see a self-driving car. It's interesting talking to the technologists, because self-driving cars bring together all of the things that we've been talking about. They have machine vision. They have robotics. A lot of what's powering them, of course, under the virtual hood is machine learning. So I think that's probably something else that will be coming to us, before too long at least. What about in a work setting, as we're working with clients on artificial intelligence, what are some of the more interesting business applications that we're seeing now?

Peter Breuer: Autonomous driving in itself is a pretty broad spectrum. You'll find a development into different levels of autonomous driving. We would typically talk about five different levels of autonomous driving. The automotive carmakers are currently experimenting with what we would call Level Four autonomous driving, which means under certain circumstances, the legal liability, when you run into an accident, the legal liability would be with the OEM, and not with the driver anymore, which is obviously quite disruptive. Here in Germany our legal authorities are thinking about the next level of law to cope with that challenge.

Other than autonomous driving, what you'll see in other industries—for example in healthcare, there are experiments with long-, short-term memory networks, which are currently on the level that cancer detection is on par with experienced medical doctors, which is also extremely exciting. Again, with that exponential development, we will see soon that machines are better in cancer detection in X-ray pictures, better than experienced medical doctors, which is quite disruptive also.

Simon London: Michael, anything that you see out there, in client work, which is novel and blows you away?

Michael Chui: One of the remarkable things is the degree to which this is an extension of the things that we've seen in data and analytics before. As Peter made reference to, one of the enabling factors for machine learning to take hold, there's large amounts of data. We've seen more and more data collected by companies and our clients, whether it be transactional data, voice data, or data from the Internet of Things in the physical world. When you have all that data, you can extend the work you've done in analytics with these AI techniques.

Take, for example, forecasting. A huge and important problem in all kinds of fields, particularly manufacturing, but supply chain, et cetera. And I think if you talk to any executive who has to deal with forecasting and ask them, "Could your forecast be any better?" they would inevitably say, "Absolutely, it could be." With the amount of data now that we're able to collect, when we bring some of these techniques to bear, we can significantly improve the accuracy of forecast in many cases. By the way, what's interesting about that is not only by bringing these techniques, say, deep learning and training, these networks, in order to increase the accuracy of forecasts, you can often multiply that accuracy increase by bringing more data to bear, so external data from outside the organization, more fine-grain data from consumers.

This is just one business problem for which we're already applying data and analytics. Yet when we bring more data, and particularly when we bring AI techniques, we can still materially improve the performance against this problem. Then when we think across the entire value chain within an organization, there's almost no place where these technologies, where AI can't improve performance.

Simon London: Something I've heard you talk about in other contexts and other forums, Michael: you mentioned a wonderful application of artificial intelligence, particularly computer vision, of the mine face in mining. Do you want to say a little bit about that? I thought that was fascinating.

Michael Chui: Another perhaps surprising application of AI is in the field of mining, where in many cases you're using explosives to blow material off the face. Then you have a choice to make as to whether you want to use more explosives to create smaller pieces, or whether you can take bigger pieces back and mill them down. What we're starting to see is the use of AI analyzing video analytics to look at the pieces that come after a charge has been deployed, and then optimize across the entire system to improve throughput as well as efficiency across the entire mine.

Simon London: That's great. That really underlines that practically every industry, probably every industry, can make use of AI technology. There are use cases right across the value chain and across the operations of most companies.

I'm going to put my journalist hat on for a minute and check us here on hype. You mentioned, Peter, that to some extent artificial intelligence is going through a bit of a hype cycle. From what we're saying, there are a lot of applications and a lot of industries, and a lot of value is at stake. This is very, very real. Do we think AI is overhyped? And if so, how?

Peter Breuer: I would say yes and no. We tried to basically define what AI is and what AI is not at the very beginning. I mean, I have a PhD in mathematics; to be honest we have not been superprecise, right? I would say today we are in a phase where we of course have applications which we would call narrow AI. Those are very specific tasks that machines today can do better than human beings. There's always that example of chess or Go now being played more successfully by machines than by human beings. Then of course there's that question about a general AI, where you have a broader spectrum of capabilities that can be managed by a machine. We are not there yet. However, we should not forget the speed of development is exponential.

The human brain is not wired to understand what exponential growth means. But we face exponential development here in those key technologies. It is coming much, much faster than we can imagine. Therefore I would say it is a little bit of overhype, but also it's coming extremely fast.

Simon London: Michael, how would you answer that same question? Hype or no?

Michael Chui: There's definitely a lot of hype. But I think what we also see is that hype's not always bad. It does get people's attention. It can sometimes end up with overinflated expectations in the short term. But in the long term, we do think that there is huge potential.

We're starting to see a lot of investment, which reflects the understanding of that potential in some of our research that we publish. Something in the neighborhood of \$26 billion to almost \$40 billion invested in AI in 2016, in the previous calendar year, much of that with the tech giants and some of it from start-ups in terms of these external investments. That reflects the cutting edge in terms of where we see real potential value to be created. Now, that said, when we look to what extent these technologies are actually being used in production, a very small percentage of companies are either deploying this at scale or within their core processes.

What we expect to see, as we have with other technology trends that we've identified that truly have the potential to create value, is that that adoption will start to increase over time, and we'll see more value capture over time.

We, in fact, have other research looking at the potential pace and rate of automation, including technologies such as AI, over time. When you incorporate all of the factors, which include the technology development, as well as requiring a positive business case, as well as the natural S-curve of adoption, we'd describe it as being slow in macro but fast in micro.

It might take decades for the full impact of these technologies, even the ones that have already been developed, to propagate through the economy. On the other hand, if you're a company that needs to compete against a competitor who is using these technologies to compete against you, that will feel very, very fast.

Or if it's going to affect you as an individual worker, that could happen quickly as well. So I think that what's incumbent upon business leaders is to understand this technology, understand how they can use this as a competitive weapon, because again, while it may take a long time for the entire economy to change as a result of AI, it can change a business case very, very quickly.

Peter Breuer: Michael, I can only agree to what you say. But this also means that any CEO of a large company—if he's not on the journey or she's not on the journey already—they should move quickly. What we also said at the very beginning, we talk about the spectrum of big data, analytics, machine learning, deep learning, artificial intelligence.

My strong suggestion to business leaders would be start your analytics transformation now if you have not already. This will require you to build capabilities, build technology, start the change in the organization, which will also be necessary to ultimately go into AI-enabled processes and AI-enabled business.

Michael Chui: Absolutely. I think this is one of those fields where there's a learning curve. There's a real learning curve. The sooner you get started on the learning curve, the quicker you'll reach higher levels.

Simon London: I wonder whether there's a case for a portfolio-of-initiatives approach, where you're looking at the stuff that you can do here and now, but you're also looking at the second horizon, even potentially getting smart about the third horizon of where the field is going. Do we think that's something that is smart?

Peter Breuer: Yeah. I think so. The fundamentals are pretty much the same anyway. We talk about a new breed of data scientists, data engineers that you need. We talk about new technologies and new IT, and if you build those fundamentals, of course our suggestion would be to take the right use cases in the right point in time, which is the portfolio approach. And by getting started now with the easier and simpler use cases, that also prepares you to take the more advanced use cases in the future.

Michael Chui: I couldn't agree more. One of the things that's easy to do when there's that much hype is to listen to a salesperson and buy what's in their bag, to use a term. Actually, what's incredibly important is to look at your own business, understand where you want to compete and understand where this technology can create the most value for you. It might be in an operations case like predictive maintenance if you're competing on the base of your operations.

If you're a sales-and-marketing-oriented organization, then perhaps the next product to buy or marketing mix or one of these other problems might be the place where AI can have the most impact. So looking across the broad portfolio and understanding where you should focus your energies is incredibly valuable.

One of the other things that's important is as executives and leaders, even if you're not an IT leader or an analytics leader, this has to be led from the top—and that is what we found in our surveys and what we found in our client work—if you're really going to move the needle in performance.

You don't have to be the data scientist. You don't have to be the roboticist or the AI expert in order to make sure that this has impact in your organization. That executive leadership we do think is important.

Peter Breuer: I tend to say that empowering companies to become analytics or AI driven is 50 percent about AI and 50 percent about [changing employees' mind-sets]. The second 50 percent, in many cases, is forgotten because everybody's so excited about computers and robots.

We tend to forget that we still have employees in the huge organization, for the time being, that we need to train in those techniques. That top-down-led change needs to trickle down to every employee ultimately. They need to embrace the new technologies and the new opportunities. Only then will you see the impact in your business.

Simon London: I do want to challenge you on the point that, as a general manager, surely you need to get a little bit smart on the techniques. You may not need to be a data scientist, but I would imagine that to have conversations with data scientists and to be able to think about the applications and the use cases in the business, and assess them in an intelligent way, and stress test them, you probably need to know just a little bit. How deep do you need to go as a general manager? What are the ways that you can do it?

Peter Breuer: There is a very important capability that I think is required here, which I would call the translator role. It is true that, on the one hand, you have the data scientists deep into machine learning and similar techniques.


On the other hand, you have the business with managers and sometimes line managers. But there is a translation required. For the time being, the manager will make the decision, and he or she will only make the decision based on better techniques like AI or machine learning if he or she trusts in what the machine provides as a suggestion.

That trust needs to be built, and some level of understanding is required. We all know the terminology "black box," and we don't like to trust the black box. Translators are required to shed some light into that black box and make it a glass box, so that line managers develop the trust and build their decisions based on the recommendation coming from the machine.

Michael Chui: One of the other things that we've discovered is incredibly important is that enabling power of data in order to have the data sets to train these systems. I had the privilege to talk with Andrew Ng, who's a premier AI researcher.

He said the companies that are taking AI seriously are engaged in multiyear, multidimensional chess games to collect the data they need in order to compete. And I think if you're in a

traditional industry and you're not thinking about competitors who are competing on the basis of chess—of these multidimensional, multiyear chess games, to find data, to compete against you—you're going to fall behind. That's an important capability and an important mind-set to bring to this problem too.

Simon London: Super. I'm afraid we're out of time, which is disappointing. I could talk about this for much longer. But thank you, Peter Breuer and Michael Chui for a fascinating discussion. If you'd like to learn more, please visit [McKinsey.com](https://www.mckinsey.com). You'll find a special page of resources about artificial intelligence with more to come over the next few months. Thank you for listening today. 

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