Capgemini

Digital Transformation Review

Eleventh Edition

Artificial Intelligence Decoded

Digital Transformation Institute

By Capgemini Digital Transformation Institute

Digital Transformation Review Eleventh Edition

Artificial Intelligence Decoded

Edited by **Capgemini Digital Transformation Institute**

About the Digital Transformation Institute:

The Digital Transformation Institute is Capgemini's in-house think-tank on all things digital. The Institute publishes research on the impact of digital technologies on large traditional businesses. The team draws on the worldwide network of Capgemini experts and works closely with academic and technology partners. The Institute has dedicated research centers in India, the United Kingdom, and the United States.

@capgemini

#DTR11

www.capgemini.com/the-digital-transformation-institute

Contents

Lanny Cohen's foreword

Lanny Cohen,
Group Chief Innovation Officer, Capgemini
@LannySCohen

Alexa, please write this foreword for me."

It's not beyond the realms of possibility that a machine could write this foreword. After all, Artificial Intelligence is now doing the work that used to be the preserve of radiologists with vast experience and carefully honed knowledge.

It's this revolutionary impact that leads me as the Group Chief Innovation Officer at Capgemini to believe that AI will be the most debated, invested in, and disruptive business technology trend over the coming years. It's both timely and a privilege, therefore, to introduce this compilation of expert insights – drawing on the views of CXOs, academics, venture capitalists and futurists – and curated by Capgemini's Digital Transformation Institute.

These insights, and our own interactions with clients, show that companies are transitioning to the age of the intelligent enterprise. The opportunities to use AI are numerous, from customer experience to operations, cyber security to risk orchestration.

AI can transform or replace existing business processes or create new ones, driving down costs and delivering greater speed, agility and quality. There are numerous new use cases and data-driven revenue streams, creating new sources of competitive advantages for bold organizations.

Not all organizations will complete the journey, or keep up the pace, however. It will require singular determination and vision to drive progress in AI, natural language processing, cognitive computing, machine learning and machine-to-machine communication.

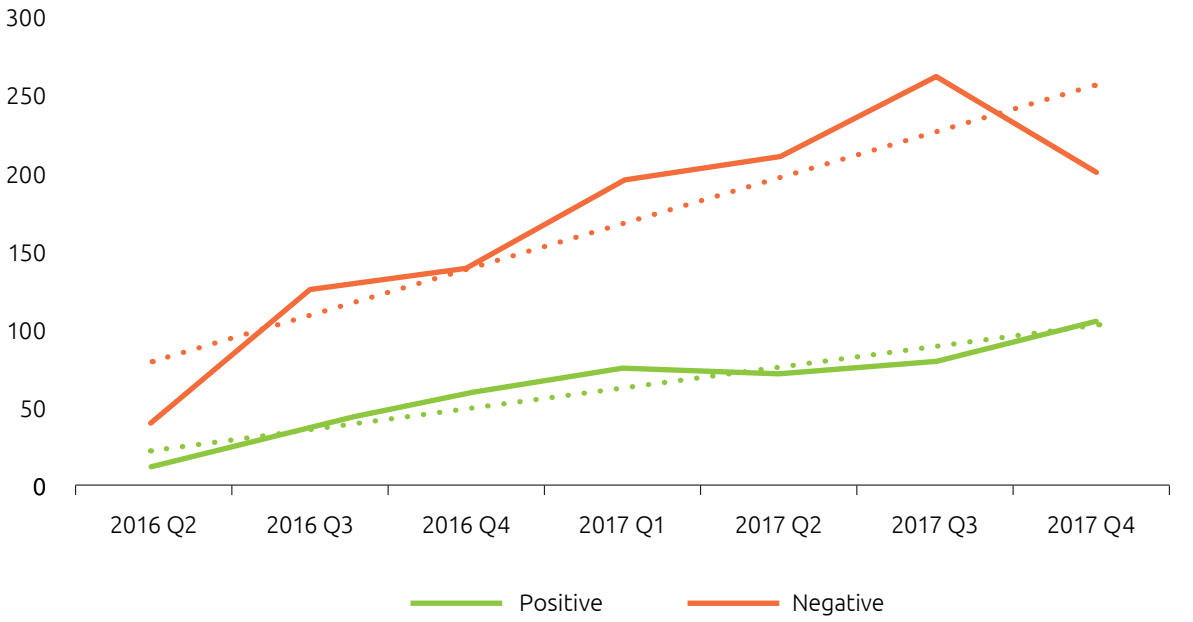
Whether you see yourself as a proactive adopter or a watchful bystander when it comes to AI, I urge you to use this Review as a reference. It is intended to inform and prepare our readers for an uncertain, but certainly exciting, future.

Artificial Intelligence: Preparing organizations and their people for drastic change

Introduction by Capgemini Digital Transformation Institute

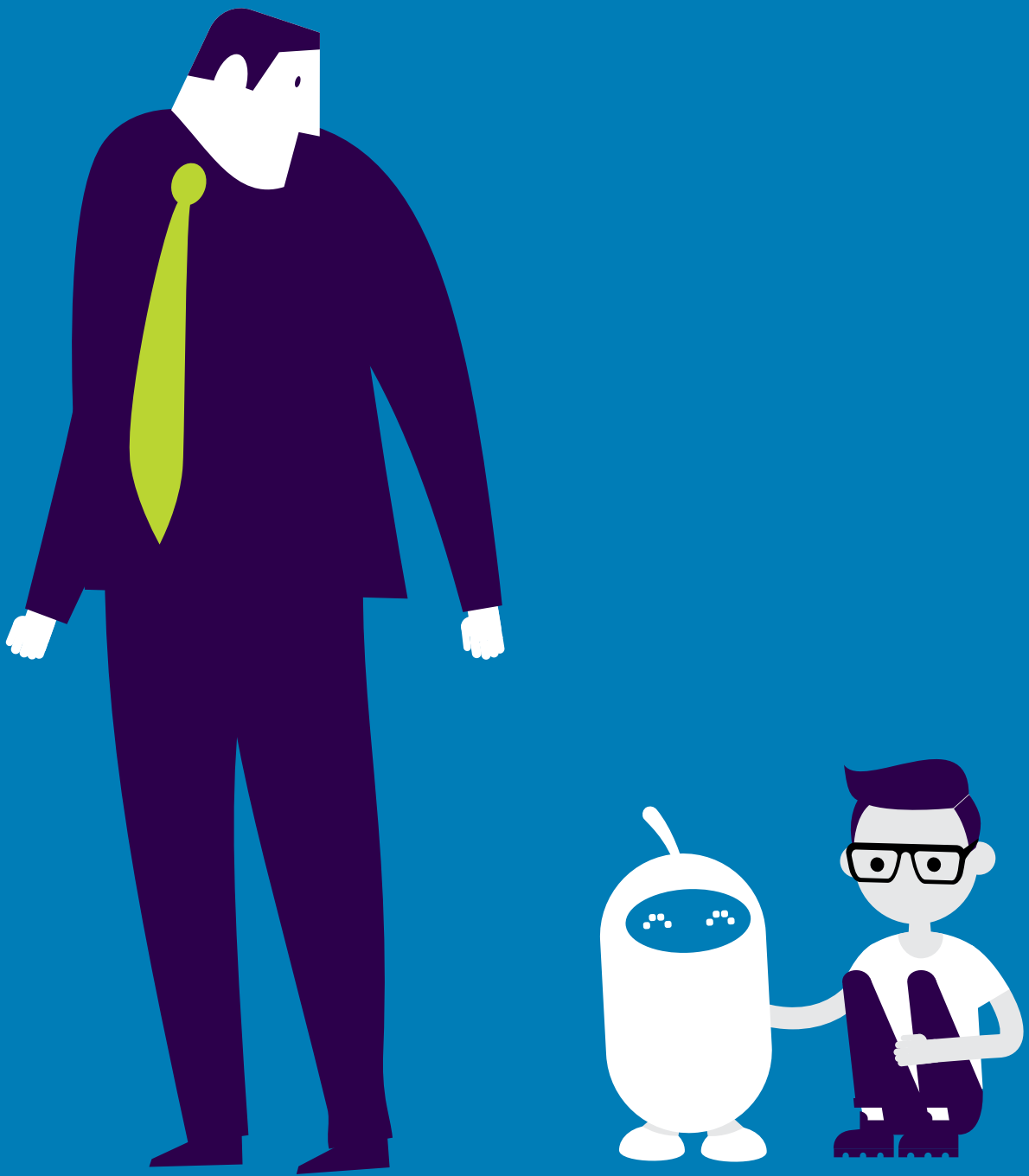
History is littered with examples of how new technologies create anxiety about job losses, and Artificial Intelligence is no exception. Anxiety levels around the technology colors perceptions and reactions, with our analysis showing that negative media coverage far exceeds the positive (see Figure 1). A fog of anxiety and ill-informed opinion is obscuring the risks and opportunities of AI.

Figure 1: AI media coverage: sentiment analysis



Source: News articles during June/July 2017. Note: Sentiment (volume of positive/negative social media messages) as measured through headlines on Artificial Intelligence and related topics from top media publications in the mentioned time period.

To cut through the fog, this edition of the Digital Transformation Review presents a more nuanced perspective on AI. To understand and explain how AI could benefit industry and society, we conducted wide-ranging research. We spoke to leaders and experts from a broad spectrum: traditional corporates, tech startups, academics, venture capitalists, futurists, and technology vendors. We also launched extensive global research surveys to examine AI and a current hot topic in the industry – voice assistants.



Leader and expert interviews: from Oxford University to Google

I am not worried about future generations, but more about us – the generation that is undergoing the shift. This will be traumatic, but more because of the pace rather than the nature of the phenomenon. Society needs to help those who will feel the brunt of the drastic changes."

Professor Luciano Floridi, Oxford Internet Institute, University of Oxford

Large organizations

Michael Natusch,
Prudential,
believes that AI can help employees work to the best of their capabilities, which is why he calls AI 'Augmented Intelligence'.

Atif Rafiq,
Volvo Cars,
explains how AI is helping Volvo, both internally and with customers.

Academia

Professor Luciano Floridi,
Oxford University,
argues that new technologies such as AI are not the problem – it's actually the pace of change.

Michael Schrage,
MIT,
outlines how AI is already competing with humans.

The 'Valley'

Frank Chen
of Andreessen Horowitz (a16z)
explains why he thinks this chapter in AI is different from previous ones, and how the current AI talent gap is only temporary.

Google's
Rajen Sheth
explains how things work at an "AI-first" company like Google.

Sentient Technologies'
Babak Hodjat
gives the startup view on AI and outlines where this technology is already delivering concrete results.

Tech Leaders

Rob High,
IBM Watson,
argues that we should treat AI as a tool for augmenting human intelligence, not replacing it.

Microsoft's
Lili Cheng
outlines why organizations need a long-term AI strategy and where AI can have the most impact.

Cloudera's
Amr Awadallah
outlines why we should not just see AI as 'intelligence', but more as the automation of decision-making.

At Google, we emphasize that AI is not something that should be done by only one group. AI is something that should be pervasive. Over the last two years, we've gone from around a couple hundred projects at Google using AI to almost 7,500 projects."

Rajen Sheth, Senior Director, Product Management, Google

Capgemini perspective: global research

In 'Turning AI into concrete value: the successful implementers' toolkit', we share findings from a global study of nearly 1,000 organizations that are already implementing AI at scale. We found that AI is creating new roles in 4 out of 5 companies. And, in 'Conversational Commerce: Why Consumers Are Embracing Voice Assistants in Their Lives', we take a deep dive into growing consumer interest in voice assistants, drawing on a survey of over 5,000 consumers. Even at this early stage, we found that nearly a quarter of consumers would prefer to interact with a voice assistant than use a company website, and that this will grow to 40% within three years.

AI used to be a very specialized area of academic research that was only discussed in specialist circles. But as AI has moved from research lab to mainstream attention, a great deal of anxiety has been unleashed. We hope this edition of the Digital Transformation Review helps our readers arrive at a more considered and informed view of this transformative technology. Please reach out to us if you would like to discuss any of these topics and the implications for your organization.

For more information, please contact Capgemini's Digital Transformation Institute and send your email to: **dti.in@capgemini.com**

View from Large Organizations

AI: Augmented Intelligence Matches People and Machines

Michael Natusch,
Head of AI at Prudential Plc, London

Michael is the Global Head of AI in the Group Digital team of Prudential plc. He joined Prudential from Silicon Valley based Pivotal Labs where he led the Data Science team. His experience lies in the application of artificial intelligence methods to large-scale, multi-structured data sets, in particular neural network-based deep learning techniques. Michael previously founded and sold a 'Silicon Roundabout' based startup and prior to that was a partner at a major consulting firm.

Michael holds a PhD in Theoretical Physics from the University of Cambridge and is a Fellow of the Royal Statistical Society. Capgemini's Digital Transformation Institute spoke to Michael to understand how AI is helping Prudential in a variety of ways already.

PRUDENTIAL

AI at Prudential – much more than a cost play

What does AI mean for you?

In her book *Artificial Intelligence*, Elaine Rich says that AI is the study of how to make computers do things that people, for the moment, are better at.[1] This is the number one thing for me: it is not about automation. When people talk about automation, they largely do so with cost in mind. AI is more importantly about scalability and customer experience primarily, and given we are in financial services, about regulation and compliance. We want to be compliant by design, and that is much more easily achieved when you have computers do tasks than humans. AI is all about customer experience, scalability, compliance by design, and then cost. In this order.

> ***AI is all about customer experience, scalability, compliance by design, and then cost. In this order.***

What are some of the AI Initiatives that you have launched?

We have developed a robo advisor, which we launched in our Taiwanese business early last year. As an organization, we employ around 600,000 financial advisors around the world. We already have a lot of information and historic data about the customer and financial markets. We want to use this data to provide sensible and tailored suggestions to our customers. It's important to point out that we don't want to replace our advisors – they are a really important route to market for us. But we want to augment them and add to their capabilities. We want our human advisors to become prime users of our robo advisor, so they can tune in even better to the actual needs of their customers. What we really want to do is to use humans to the best of their capabilities. AI is taking away the time humans previously spent on repetitive issues and allowing them to focus on where human intelligence can drive value – for both themselves and for customers. It is also why we call AI 'augmented intelligence'.

> ***We don't want to replace our advisors – they are a really important route to market for us. But we want to augment them and add to their capabilities.***

[1] *Artificial Intelligence*, Elaine Rich and Kevin Knight, 1991.

Employees welcome AI that helps them

How have employees reacted to these technologies?

We are clear on what we want to achieve – we have no interest in killing jobs. We know that the people who work for us are extremely well-trained, understand our products, and understand our customers. We want to use those team members to the best of their capabilities. When we implemented an intelligent voice box for compliance purposes, we expected a lot of apprehension and resistance.

Surprisingly, employees were quite enthusiastic. The reality of their job is that they spent a lot of time on real humdrum issues that really don't require any of their skill and knowledge. For instance, they spent four minutes on every call just doing identification and verification of the caller. And they told us – 'look, if your box gives us those four minutes of a call back, that would already be an amazing advantage'.

Selling AI into the business: prototyping and a focus on demonstrable successes

Can you give us a sense of the investment that was required before you saw benefits and returns?

'No' is the simple answer, though not for reasons of confidentiality. It is because we do not have an overall business case for artificial intelligence. We try and build ourselves into every single project and activity that is going on and influence the business case as it happens. In a highly federated organization such as Prudential, our role is to ensure that the business owners see the value in what we are trying to achieve and fund it.

When we implemented an intelligent voice box for compliance purposes, we expected a lot of apprehension and resistance. Surprisingly, employees were quite enthusiastic.

"AI is the study of how to make computers do things that people, for the moment, are better at." [1]

AI priorities at Prudential

Priority 1:
Customer experience

Priority 2:
Scalability

Priority 3:
Compliance by design

Priority 4:
Cost

Launched robo advisor in Taiwanese business

"We don't want to replace our advisors. But we want to augment them and add to their capabilities."

Plan to leverage robo advisors to support their **600,000 financial advisors** base with sensible and tailored suggestions based on historical data.

Employees welcomed the intelligent voice box for compliance purposes as it **saved them four minutes per call.**

"We try and build [AI] into every single project and activity that is going on and influence the business case as it happens."

Cultural and human issues:

How to deal with robots?

How to get used to the real-time nature of using software and seeing feedback coming in after changing a few parameters?

How to overcome skepticism towards AI-driven solutions?

[1] *Artificial Intelligence*, Elaine Rich and Kevin Knight, 1991.

How do you convince business owners of the merits of investing in an AI-driven solution?

We have a three-step process. Firstly, we have a strict no PowerPoint policy. If we are talking to an executive, we need to have a working demo. Secondly, we build on existing successes that we've had in other parts of the organization. And the third, and most important part, is how we make rapid prototyping a key part of our approach. We put together a "hot house" where we pull a team of people from across the organization, give them three days and a set task and have daily demos. The team comes up with a draft working prototype that the judges of the hot house – typically the business owners of the problem – can see. They can then take a clear call on whether it works or doesn't. If it is on the right lines, we get the remainder of the 90-day cycle to develop it and make sure it actually works. This is exactly how we got the go-ahead for our regulatory voice box initiative.

Biggest challenge – getting people comfortable with robots

What were the biggest challenges you faced in rolling out these initiatives?

There are two major challenges.

Firstly, how to deal with robots? How to get used to the real-time nature of using software and seeing feedback coming in after changing a few parameters? How to overcome skepticism towards AI-driven solutions?

The second challenge is more technical in nature, e.g. take a call on data availability, or the platform/technique you want to use.

Do you see the need to develop talent and skills as a key challenge?

We have a structured approach to enhancing digital skills. For instance, we are running a training program for employees from all BUs to learn Alexa programming skills. The primary objective is not to develop AI solutions, but we are trying to increase the level of confidence that our colleagues have with AI. We hope to build an understanding of what AI both can and cannot do, as they are equally important. But one thing we are not going to do is go on a big hiring spree and try to hire up all the AI experts around the world. Instead, we will focus on hiring people with the right mathematical background and aptitude to understand our problems, our data, and our customers.

Where can AI be used?

Computers have taught people to be very distracted. One of the things that could therefore be really interesting is how AI can help people manage their time more effectively.

Lili Cheng, Microsoft

AI will be quicker to enter industries that are heavily regulated.

Michael Schrage, MIT

We have deployments for example with Sunglass Hut or with Skechers, and in these cases, we have seen 30 or 40% improvements in conversion rates.

Babak Hodjat, Sentient Technologies

The low-hanging fruit is basically anywhere where you're making a recommendation, anywhere where you need to understand what people are saying, or anywhere where you need to recognize what's happening inside a picture.

Frank Chen, a16z

AI is taking away the time humans previously spent on repetitive issues and allowing them to focus on where human intelligence can drive value.

Michael Natusch, Prudential Plc

The most popular use case right now is in the contact center. There is just so much room for improvement in the customer experience, the abilities of the agents involved, and the relationship between the institution and its customers.

Rob High, IBM Watson

Car companies are actively using AI in their autonomous drive efforts to solve very complex problems around being able to take you from A to B in a safe way. But every facet of this industry can benefit including how cars are made, sold and to invent new customer experiences.

Atif Rafiq, Volvo Cars

Putting AI to Work: With Customers and Within the Enterprise

Atif Rafiq,
Global Chief Information Officer
and Chief Digital Officer

Atif Rafiq is the Global Chief Information Officer and Chief Digital Officer of the Volvo Car Group. At Volvo, Atif is spearheading the digital transformation of Volvo Cars by building new consumer experiences and the digital products behind them. Atif joined Volvo Cars from McDonald's where he was a Senior Vice President and the first Chief Digital Officer with a focus on the future of customer experience and brand engagement, powered by digital technology. Earlier, Atif was the General Manager of the fast-growing Kindle Direct Publishing unit at Amazon helping give shape to the future of content and books. Atif also lead Yahoo's Local Business and managed Product Marketing/ Strategy for Yahoo News. Atif began his long career of almost two decades in Internet businesses starting with AOL and Audible. In 2001, Atif co-founded and served as CEO of Covigna, an innovative content management software provider until it was sold to Proquest. Atif holds a university degree in Mathematics-Economics and an MBA in Finance and Marketing. Capgemini's Digital Transformation Institute spoke to Atif to understand his views on Artificial Intelligence and how it impacts the automotive industry and Volvo Cars.

How does Volvo Cars see artificial intelligence (AI)? Are you already deploying it, and if so, in what functions?

Car companies are actively using AI in their autonomous driving efforts to solve very complex problems around being able to take you from A to B in a safe way. This typically gets the most headlines. And it's been used for a long time in driver assistance and active safety features of the car, like for instance traffic sign recognition and threat assessment.

But every facet of this industry can benefit including how cars are made and sold and to invent new customer experiences.

Let's take the process of trading in a car and the need to describe the condition of the vehicle. Objectively determining the condition can be a machine-learned activity that makes things easier for everyone and perhaps increases trust. This can work by taking images of your car's conditions and matching them against large data sets of cars categorized according to different physical conditions. The same goes for returning a rental car accessed through a sharing service. For example, determining the car comes back in the same condition compared to when it was checked out.

Another useful application, currently under development, is predictive maintenance. Parts within your vehicle are designed to work well for a long time. Now, with AI we can observe signals about how they perform against data sets of repairs to predict a potential need for maintenance before anything stops working properly. This clearly holds huge benefits for the consumer, where we can optimize the service intervals of the car and avoid any unnecessary downtime. All of that leads us toward the goal of a hassle-free ownership and better experience for the driver.

As you can see, our aim is to use AI to solve meaningful customer and enterprise problems anywhere it makes sense.

> ***Our aim is to use AI to solve meaningful customer and enterprise problems.***

Where do you think AI can help a large auto manufacturer such as Volvo Cars?

We are working on uses for the consumer and for the internal enterprise. Both opportunities are significant.

Let's start with our vehicles. To make good use of your time in the car, you might want to operate different features with your voice. We're making strides here by being one of the first companies to partner with Google on a native version of Android in the car that makes it easy to use Google Assistant to access all kinds of information and services. We realize there are digital assistants like Amazon Alexa and we will find the best ways to support them.

Then of course with the car we have self-driving both for consumers who buy our cars and B2B customers like Uber which seek to operate fleets of autonomous cars. Both of these are major market opportunities for us.

And we can make an endless series of experiences around owning or using a car easier. My favorite at the moment is the idea of using exterior cameras of cars to figure out when your car needs a wash. This is definitely doable though hard to get right because, as you can imagine, everyone has a different perception of cleanliness. Wouldn't it be great to learn how each person wants the appearance of their car to be and to simplify life by dispatching a cleaning service to keep it that way?

The good news is we have the building blocks here with our on-demand wash service. Customers in certain cities can use the Volvo on Call app to request such a service. These kinds of ideas are not technology for technology sake. They can help us fulfill our promise to give one week of quality time a year back to consumers in 2025.

Since I also run global IT at the company, I'm happy we are putting effort into enterprise use cases. Those are just as plentiful when we think about making cars, the amount of automation in manufacturing, production, and logistics.

> ***We are working on AI use cases for both the consumer and for internal enterprise use. Both opportunities are significant.***

What is your view on the skills issue with technologies such as AI? Are you finding good AI talent easily?

The skills involved with AI and machine learning are in demand, yet we have been successful in recruiting talent. That's because our industry is one of the best places for real applications that will influence how millions of people live. There is so much technology in cars—sensors, cameras, radar, etc.—generating so much data with increased compute capacity. People see this as a rich environment in which to work. There's a unique opportunity right now to solve fundamental technology problems. Fortunately, we've been able to recruit talent in both Sweden and Silicon Valley (through our digital tech center).

Of course, we can do better. Part of the approach needs to be sharing ideas and socializing the work the company is doing so we get noticed. I think we will do more of that as we look forward through conferences and events.

How is AI being driven in Volvo? Is there a central leader for all initiatives?

There are some dedicated efforts as you can imagine like autonomous drive that we resource through our JV with Autoliv in a company called Zenuity. Zenuity is a separate company building autonomous drive software and they employ a large number of software engineers, including those familiar with AI.

More broadly we have a Center of Excellence (CoE) that brings together different skills from algorithm development to data science to setting up compute environments. We formed this CoE over the past 12 months and this group shares learnings, applies its efforts to different parts of the company and will find ways for us to place AI in the heart of our development activities everywhere in Volvo.

A good objective for our company is to have AI models for all software development domains where it applies, just like Google has a clear method to "AI-ify" every product from mail to photos to maps. And to do that we will need to drive into the core development processes. This is a big ambition and I'm hopeful we will take solid steps in the next 1-2 years.

What is your take on the debate of the impact of AI on jobs?

There are a number of offsetting factors when it comes to the use of AI. The question is how will it net out?

If AI eats jobs at a rapid rate without producing new work for managers in corporations, that will make companies more profitable but hurt society. Tech companies are keenly aware of this dynamic and so we see conversations about universal basic income. I think Amazon's move into healthcare, described as a not for profit motivation, can be a positive offsetting factor to potential job loss.

My own take is that we will see AI live alongside humans in carrying out managerial work and that AI will assist humans to unlock human potential, allowing them to focus on higher and higher value tasks and activities. The work of humans in corporations is going to be very hard to replace for a long, long time but it will need to rise to higher and higher levels of contribution. AI can help make the workplace more objective in decision-making based on real organizational learning.

> ***AI will assist humans and unlock human potential to focus on higher and higher value tasks and activities.***

Volvo has publicly said you want to put driverless cars on the road by 2021. You've also partnered with Uber. What role does AI play in driverless cars?

AI is the brain that takes advantage of the car's ability to sense the world through sensors, cameras and other hardware like LIDAR* to make decisions. These decisions must be accurate, fast, and continuously improved so that we make driving safer than it is today. Of course, AI is at the heart of that.

Volvo has historically been known as a brand that stands for safety. How is AI helping you there?

Since the transition of focus from passive to active safety, information technology has been at the core of what makes up safety development. Today, AI assists in this development in two fundamental ways: solutions to understand when a crash is imminent to trigger pre-emptive safety systems and, second, increasingly to avoid accidents by understanding the environment and anticipating problems before they happen.

Within safety, AI can also considerably enhance the tools and methods used during the development phase. One example is helping us to understand complex situations with a lot of interacting agents, which is typically the norm when it comes to this area of engineering. I think we will see more simulation software based on AI that allows for modeling complex scenarios and some unsupervised learning insights.

You have expressed a vision where technology dramatically simplifies life for the car owner. Can you describe it and what if any role AI plays in actualizing this vision?

We have a publicly stated goal of giving our consumers one week of quality time back each year by 2025. That can come in many ways.

For example, by creating a car experience that works well with the rest of your digital ecosystem. Cars can do much better here and that's why working with a company like Google on native integration of Android will connect things in very interesting ways. Knowing your calendar and where you have to go can be used to save people time in all sorts of ways. For example, imagine the case where you have an early morning meeting, the fuel level in your car is low and the distance to get to the morning meeting is a bit far. Why should this stress you out in the morning?

> ***"We have a publicly stated goal of giving our consumers 1 week of quality time back each year by 2025. That can come in many ways.***

* light detection and ranging

AI @ Volvo

"Our aim is to use AI to solve meaningful customer and enterprise problems anywhere it makes sense."

Feature navigation using voice

Use Google Assistant in car

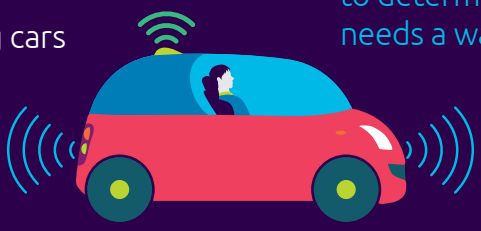
Around owning/ using a car

Using exterior cameras to determine when car needs a wash

Individuals

Self-driving cars

B2B customers like Uber



Enterprise:

Automation in:

Manufacturing

Production

Logistics

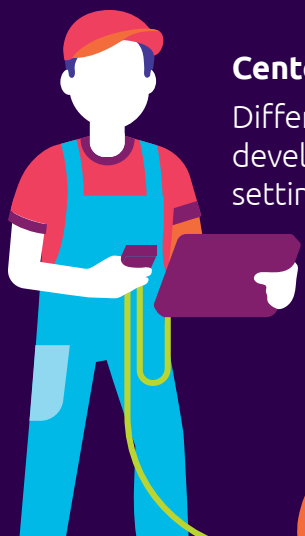
"The automotive industry is one of the best places for real applications that will influence how millions of people live."

AI Governance @ Volvo

Volvo – Autoliv Joint Venture

Zenuity – Company for building software for autonomous cars

"We have a publicly stated goal of giving our consumers 1 week of quality time back each year by 2025."



Center of Excellence

Different skills from algorithm development to data science to setting up compute environments

There's enough knowledge between the car and your calendar to solve this problem the evening before your meeting and reduce morning headaches. We talked about dispatching fuel on-demand and this one case where you might appreciate it.

Speaking of dispatching fuel, we are testing a number of convenience services like valet pick-up of your car for service or repair, test-drives at home, and even in-car delivery of packages (sometimes that is safer or more convenient). For Volvo and its partners to provide these services, we have to intelligently route resources like people and cars around. You can imagine AI providing a smarter basis for these services that improves utilization and efficiency of the resources.

Coming back to the customer, owning a car used to be about freedom. Technology is going to bring that freedom back by removing headaches of managing tasks like these, where AI can be an enabler behind the scenes.

You have an uncommon role for the automotive industry—a joint CIO/CDO. What advantages do you think that brings to accelerating digital initiatives?

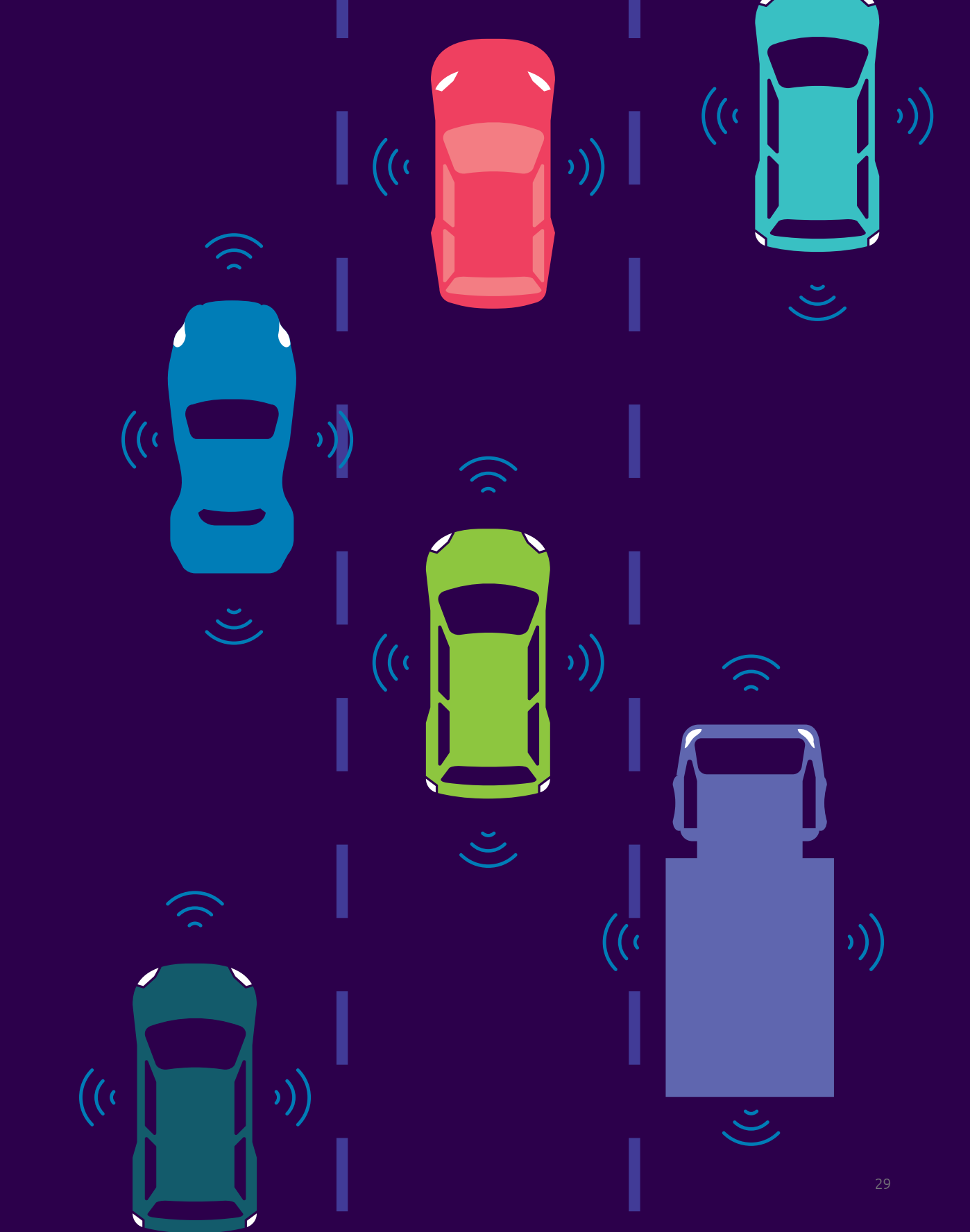
> ***We think about digitization as a fundamental change in how work gets done through real agile processes.***

Typically, a CDO focuses on consumer facing innovation and technology, while a CIO oversees the digitization of the internal enterprise. You can imagine there's a good amount of dependency between the two, such as platforms that serve both consumer and enterprise use cases.

One example is the connected car platform, which is used by consumers to handle remote tasks like heat, locking, and sharing, but also for internal use like collecting information about the performance of the car for maintenance. Another example is data platforms which house customer information used in retail interactions for sales and service, typically powered by enterprise systems. This platform is also used when consumers interact with us directly over the web or mobile. By combining the consumer and enterprise digitization efforts in my role, we aim to leverage common capabilities more effectively.

On top of this, we think about digitization as a fundamental change in how work gets done through real agile processes. To do this only for consumer technology and software and not for enterprise is short sighted. We are equally excited by the potential for digitization to fundamentally change how software gets developed, managed, and driven by our strategy both for the consumer and the enterprise.

Lastly, I think this combination of responsibilities make sense for all kinds of industries because customers don't care how your company is organized. It's odd to settle for one part of a company moving at a slower pace than other parts; the ambition must be bigger across the board.



Academia

AI: Adaptable Intelligence

Professor Luciano Floridi,
Oxford Internet Institute,
University of Oxford

UNIVERSITY OF OXFORD

Professor Luciano Floridi is the Oxford Internet Institute's (OII) Professor of Philosophy and Ethics of Information at the University of Oxford, where he is also the Director of the Digital Ethics Lab. Outside Oxford, he is Faculty Fellow of the Alan Turing Institute and Chair of its Data Ethics Group; and Adjunct Professor of the Department of Economics, American University, Washington D.C.

His research concerns primarily Information and Computer Ethics (aka Digital Ethics), the Philosophy of Information, and the Philosophy of Technology. Other research interests include Epistemology, Philosophy of Logic, and Philosophy of Science.

Capgemini's Digital Transformation Institute spoke to Professor Floridi to understand his views on ethics in AI and the issues that organizations need to bear in mind when designing AI solutions.

Pace of change is the bigger challenge

AI is most often equated with job losses. What is your take on this debate?

I think there is a distraction and a real issue here.

The distraction is the fear that jobs will simply disappear completely and that this will be a major disaster. Why do I think it is a distraction? Because it's based on two fallacies.

The first fallacy is that there is only a certain fixed amount of work to be done. This is not true. There is as much work as you want to do, depending on resources, time, who does what, skills, and so on. The example I have in mind is how much work you can do to clean your house. It's bottomless. It's just that at some point you draw a line and decide that it's clean enough. So, there is no fixed amount of work as such.

The second fallacy is that AI will simply replace work, when it will also make work surface that was not economically viable to do in the past. For example, if I buy a new robot to cut the grass, the gardener will finally have time for the roses. Earlier, having time for the roses was not viable because it was too expensive. Having the robot cut the grass makes the job of taking care of the roses economically viable.

If you consider these two issues – fixed amount and viability – then you know that AI impact is actually much more complicated. The oversimplification is the distraction.

> *There is no fixed amount of work.*

So, what is the real problem then?

The real problem is not the replacement in itself. It's the pace at which the replacement is happening now and will continue to happen. Technologies in the past have replaced jobs slightly more slowly than anything we are seeing today. Today, from literally one year to the next, some jobs will become totally obsolete. If that is the case, how you re-train and re-skill the workforce – and how you develop social support systems to mitigate the impact – are the real issues. Future generations will have new jobs. There is no doubt about this. Computers will require human beings to handle them. Look at Audi for

> *Future generations will have new jobs. There is no doubt about this.*

example. They have a one-to-one ratio – every robot introduced requires a human being. So, more robots may actually require more human workers. I am not worried about future generations, but more about us – the generation that is undergoing the shift. This will be traumatic, but more because of the pace rather than the nature of the phenomenon. Society needs to help those who will feel the brunt of the drastic changes.

I am not worried about future generations, but more about us – the generation that is undergoing the shift. This will be traumatic, but more because of the pace rather than the nature of the phenomenon. Society needs to help those who will feel the brunt of the drastic changes.

What kind of timeline do you believe we are looking at when it comes to large-scale impact on jobs?

We will see the impact in the next 10 to 20 years, but exactly when depends on many variables that are highly unpredictable. For example, will we see an AI backlash – an opposition to AI similar to what we saw against genetically modified crops? The potential social reaction and legal impact are still very unclear, and this could affect the impact of AI quite dramatically. Will we see regulation, for example, on when automation is allowed in certain contexts? Think of all the current legislation we have when it comes to security in public transport. For example, the law may still require to have drivers on board of buses and taxis, as it does for airplanes. We might see similar legal frameworks with AI and automation.

The potential social reaction and legal impact are still very unclear, and this could affect the impact of AI quite dramatically.

But I would say that, within 20 years, the world will have profoundly changed.

The law may still require to have drivers on board of buses and taxis, as it does for airplanes. We might see similar legal frameworks with AI and automation.

You mentioned re-skilling. Is it up to companies to re-skill their staff?

This is a very important question. If we talk about skills that you acquire at an early stage of your career, this is very much a joint effort between companies and broader society, including the educational system. But when it comes to re-skilling someone in their fifties, for example, it seems to me that this is more on the societal side and less on companies. It is up to our society to help with the transition.

Companies should think of AI as a reservoir of smart solutions

In terms of organizational impact, will AI truly change the structure of large companies?

In the next three to five years – at the point when AI gets into the pockets of ordinary citizens – I suppose companies will start to experience AI on tap. The analogy here would be with cloud computing or electricity. You don't produce your own electricity, you just take advantage of it. Likewise, you might just take advantage of smart solutions that can be deployed to solve specific problems. Companies that start thinking in terms of AI as a reservoir of smart solutions are going to be better placed than others to take full advantage of the new digital transformations. Even the structure of organizations will be affected by where they can deploy these AI solutions.

> ***You don't produce your own electricity, you just take advantage of it. Likewise, you might just take advantage of smart solutions that can be deployed to solve specific problems.***

Which industries are best placed to benefit from AI?

The medical sector is in for major changes due to AI. I also believe AI will impact the security and safety sectors significantly. These include anything that needs supervision 24/7, such as monitoring or prediction of possible faults in airplane engines, or early signaling of potential threats. Basically, anything to do with management, safety, prediction and optimization becomes more efficient with AI.

Adapt AI to humans, not the other way around

What are some of the ethical considerations that organizations need to consider as they implement AI systems?

I fully subscribe to the usual discourse around privacy and protection of personal data with AI. At the same time, I believe that is not complete.

My first concern is that once we have real, everyday AI, we need to make sure that the design of smart environments does not result in us always being the ones who adapt to AI rather than vice versa. We are currently deploying smart agents that are rather rigid in what they are doing. Think of a world where there are lots of Stage III or even Stage IV driverless cars. This will mean we will see humans adapting to artificial agents. While this is probably inevitable, I would say it is an ethical imperative to make sure that the malleable, adaptable and intelligent human agent in the partnership is not the one that adapts all the time, compared to the stubborn, hard-working and rigid AI agent.

> ***It is an ethical imperative to make sure that the malleable, adaptable and intelligent human agent in the partnership is not the one that adapts all the time, compared to the stubborn, hard-working and rigid AI agent.***

Secondly, we are surrounded by agents that are gently nudging us in certain ways – to take our holidays abroad or read the next Harry Potter book. This constant gentle pushing and pulling is definitely affecting us. These constant reminders and suggestions are shaping us. How do we make sure that we are aware of that? In other words, that we know what we are doing and that this gentle nudging is reduced? We need to protect our autonomy.

What role should governments play in developing policies for these checks and balances?

I think the checks and balances are essential. I would like to see a normative framework with maybe an ombudsman or organizational self-regulation for AI. We need an authority where we can go and say 'there was a mistake', or 'it wasn't me', or 'can we check this because this isn't quite right?'. Prevention and redressing of problems caused by AI must go hand in hand.

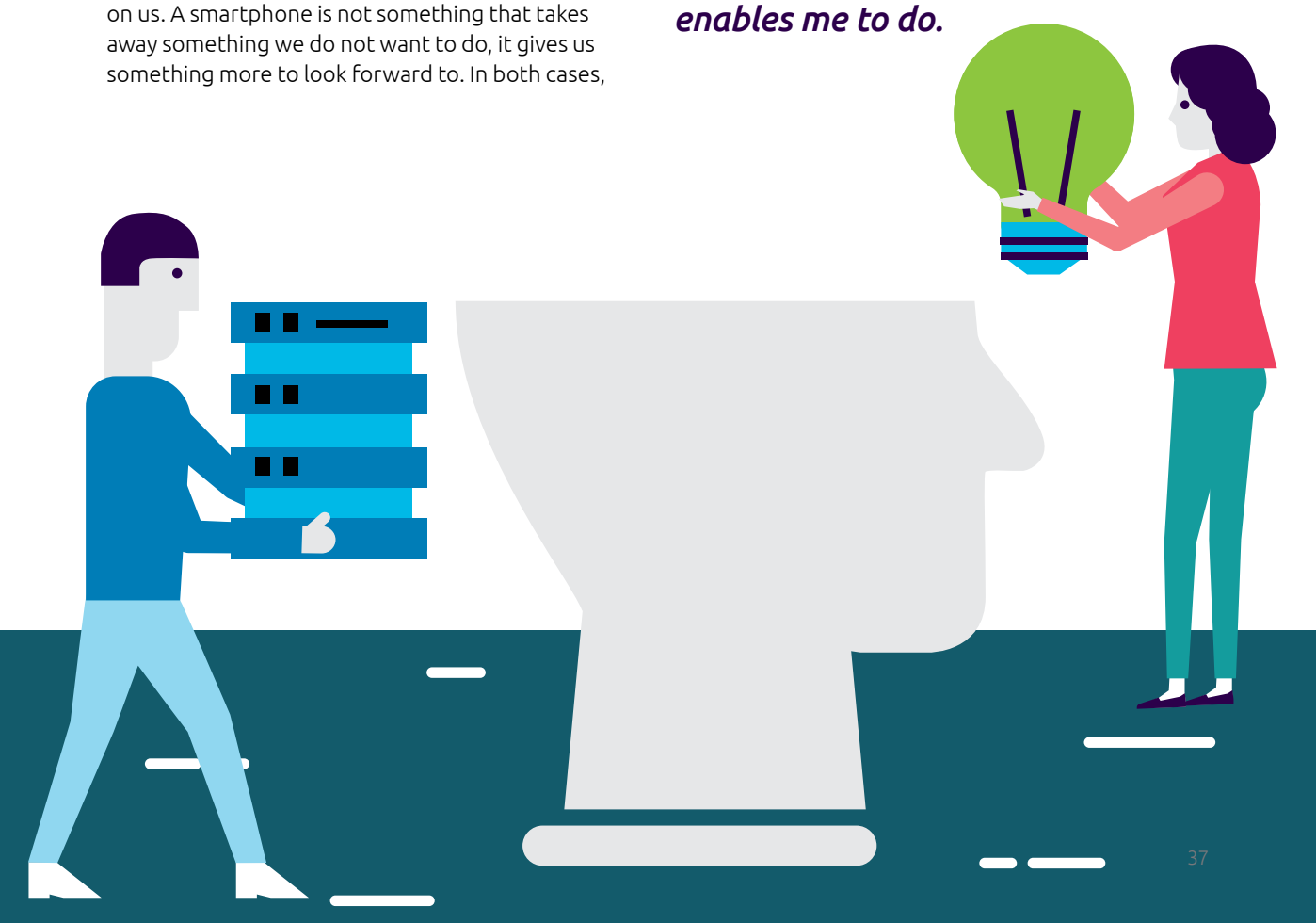
What AI application do you think will transform people's lives?

If you look at good consumer technologies, they fall in two camps.

First, there are things that we do, but don't want to do. For instance, imagine if AI can help us with a robotic arm that puts the dishes inside the dishwasher and take the dishes out of the dishwasher and back into the cabinet. That is a category of application that's useful. So, anything that does things that we are forced to do these days, but we don't have to do anymore, would be a great success.

Second, there is a category of things that we wish we could do, but we cannot or didn't even know. Once a technology solved the issue, it dawned on us. A smartphone is not something that takes away something we do not want to do, it gives us something more to look forward to. In both cases, a good way of assessing an AI application is not whether people initially buy it, but whether they buy it again when it breaks down. So, the AI that will be successful is not the one I want, it is the one that I want again because of what it makes me not do, or what it enables me to do.

> ***The AI that will be successful is not the one I want, it is the one that I want again because of what it makes me not do, or what it enables me to do.***



AI: Survival of the Smartest

Michael Schrage,
Research Fellow at the MIT Initiative on the Digital Economy, MIT Sloan and Visiting Fellow, Imperial College, London

Michael Schrage is a Research Fellow at the MIT Sloan School's Initiative on the Digital Economy. He is the author of the books Serious Play (HBR Press), Who Do You Want Your Customers to Become? (HBR Press) and The Innovator's Hypothesis (MIT Press). His latest book, The Innovator's Hypothesis, looks at how to develop innovation in a quick, cost-effective way. Michael is a columnist for Harvard Business Review, Fortune, CIO Magazine and MIT's Technology Review, and is widely published in the business press.

Capgemini's Digital Transformation Institute spoke to Michael to gather his views on what AI means for large organizations.

How would you define Artificial Intelligence?

We first have to distinguish traditional AI from machine learning (ML). Many people understand "Artificial Intelligence" as software that appears to replicate, mimic, or effectively copy the human thinking or cognitive process. With ML, the algorithm is capable of learning both in a supervised and unsupervised way, based on the way it is trained on data. I believe that machine learning is really becoming a much more important pillar and organizing principle in algorithmic, systems, and process design. We see this in companies like Google, Facebook, and Netflix. We see this emerging in organizations that are exploring the Internet of Things.

Where do you think we are with the development of AI?

What AI already allows most organizations to do today is hollow out or replace ordinary cognitive work. On average, it is more economical, and makes more business sense, to invest in AI systems that reliably manage data and processes in 'above average' ways rather than invest in 'typical' human beings or groups. I believe that at the very top of the pyramid there are still measurable and significant human being advantages. But right now, with AI in combination with machine learning programs, you can design business processes where the system consistently, reliably, and cost effectively outperforms its human counterparts. We see this in financial services; we're seeing to more in manufacturing and industrial controls; we're certainly seeing it in IT/digital services. It is a very bad time to be average in performance. Even being above average no longer commands a market premium.

AI offers significant opportunity for data leaders in a compliance-oriented world

Where do you think AI will have the most impact?

AI will be quicker to enter industries that are heavily regulated. That's because compliance and regulatory-driven industries are very complicated, but they generate lots of data. Also, compliance cost is an overhead cost that must be reduced. So, wherever there is intense regulatory oversight – such as finance, energy, pharmaceuticals, etc. – you will see disproportionate investments in AI and ML.

> *AI will be quicker to enter industries that are heavily regulated.*

How can organizations realize the transformative impact of AI?

Companies need to manage data as an asset to get meaningful and measurable economic returns. Start there. Every company is made up of three categories of data managers. Immature managers ask, 'how do we manage this data?' More mature managers ask, 'how do we get value from this data?' And superlative managers say, 'what kind of partnerships, governance, and technological investments do I need to make to get best-in-class returns on this asset?'

AI success is a question of leadership

What separates companies that make a success of AI from the laggards?

AI leaders have a policy and process around data governance and treat data as an asset. How they oversee, and share data is critical to both efficiency and growth. They also have key problems or business cases that lend themselves to known structures for AI and ML algorithms, such as intrusion detection systems, trading in financial services, predicting churn from subscribers or identifying certain kinds of customers. These companies view AI as an enabler and they are ready to experiment. They've got the digital/IT infrastructures to do so.

How should organizations run AI initiatives – top-down or bottom-up?

Pockets of excellence almost always exist so that's a tough question to answer without knowing the firm. Many financial services companies, for example, are doing excellent machine learning work and data science work. But it becomes like a ghetto. They cannot move it to other parts of the organization, because the other parts of the organization don't understand it, or don't have the talent, or are concerned that people might lose their jobs. These are human issues that have nothing to do with the capabilities of the technology and everything to do with the culture of the organization and the quality of its leadership.

The future of job and work

How do organizations get the right AI talent, and can they upskill their existing people?

Are organizations able to hire data scientists versus organizations like a Google or Netflix? If you are a tier-1 company, you probably have a decent chance at getting quality data science, machine learning and AI folks. But if you're a tier-2 company, what do you offer besides lots and lots of money?

Organizations need to know what it costs to turn a good 40-year-old coder and developer into an ML or AI coder and developer. What portion of mid-career people can be converted in such a manner? I have no good answer to that. But I think that is the dominant human capital question going forward. I worry less about folks in their 20s, I worry about people in their 40s.

> *I worry less about folks in their 20s, I worry about people in their 40s.*

What kind of jobs do you think are at immediate risk of being disrupted by AI?

At this stage it is still not clear whether the level of job generation will match job destruction. I don't know. It is challenging to say whether multiple professions will go away or whether how you create value in those professions fundamentally changes. The name may be the same but what you do and the technology you're doing it with are different. For instance, the idea that radiologists in the year 2025 will be doing largely what they did in 2005 strikes me as difficult to believe. Similarly, in America, it is easy to imagine scenarios where judgments for certain kinds of arbitration or civil lawsuits are rendered algorithmically rather than by human beings making arguments in front of a judge.

More specifically, I believe that the compliance staff at pharma and financial services companies will be cut by between half and two-thirds within five to seven years. This is precisely because large organizations are using AI and ML to manage the compliance process and the lawyers who remain will largely supervise algorithmic outcomes rather than people. You won't need nearly as many people do it.

> ***In America, it is easy to imagine scenarios where judgments for certain kinds of arbitration or civil lawsuits are rendered algorithmically rather than by human beings making arguments in front of a judge.***

Battle between process efficiency and user experience

How do you see AI evolving in the future?

I see a big battle in ML and AI between process efficiencies and user experience. Amazon, Netflix and Google are good examples of organizations that try to balance user experience with process efficiencies. The financial services companies and industrial companies are torn, because their first goal is improving their return on assets. This brings in a bias in their usage of ML and AI – how do we improve our internal process efficiencies as opposed to giving our customers and users a better experience and better value? I think that will be the great schism in the market over the next 5 to 10 years.

Do you need to know AI to leverage AI?

You don't produce your own electricity, you just take advantage of it. Likewise, you might just take advantage of smart solutions that can be deployed to solve specific problems.

Luciano Floridi,
University of Oxford

I don't think you need to be an expert in the technology of AI to benefit from it. You don't need to be skilled in AI, you need to be skilled in your use case.

Rob High,
IBM Watson

Existing developers in traditional organizations shouldn't have to immerse themselves into the deep learning model in order to benefit from it.

Rajen Sheth,
Google

We are not going to go on a big hiring spree and try to hire up all the AI experts around the world. Instead, we will focus on hiring people with the right mathematical background and aptitude to understand our problems, our data, and our customers.

Michael Natusch, Prudential Plc

We don't want people to have a PhD in AI to benefit from AI.

Lili Cheng, Microsoft

The ‘Valley’

Make AI a Daily Habit

Frank Chen,
Partner, a16z, San Francisco

ANDREESSEN HOROWITZ

Frank Chen is a partner at the venture capital firm Andreessen Horowitz. He runs the research and deal team at the firm, which systematically identifies and evaluates investment opportunities, and builds knowledge about technology, people and trends.

Prior to Andreessen Horowitz, Frank was the vice president of Strategy for HP Software, where he helped the company understand and act on changes resulting from the rapid enterprise adoption of virtualization technologies across servers, network and storage. Frank joined HP Software through its acquisition of Opsware, where he was the Vice President of Products and User Experience for a broad set of Opsware's data center automation products.

Frank holds a B.S. in Symbolic Systems from Stanford University, where he graduated with distinction and was elected to Phi Beta Kappa. Capgemini's Digital Transformation Institute spoke to Frank to understand how he sees AI as a partner at one of Silicon Valley's most respected VC firms working with some of the hottest startups.

AI is here, and it will impact everyone

AI has been around for a while. Why is it different now?

AI is now inside a bunch of mainstream applications that everybody uses from Siri to Pinterest. This is a relatively recent phenomenon. Probably a quarter of applications have AI today and it's growing fast against maybe less than one percent 20 years ago. The big change from a technology point of view has been the 'deep learning' machine learning algorithms in conjunction with the availability of lots of data and the ability to crunch that data on many different computers. That is what has made the difference since when we started in 1956.

Where will AI be most useful?

Asking where AI will be most useful is like asking which sectors were going to benefit when database technologies emerged. It turned out the answer was every single one of them. It's hard to imagine a piece of software where you don't have a database behind it. They were good for United Airlines, good for Starbucks, and good for Exxon. AI is exactly like that. Companies need to be thinking about what to build, how to price, how to reach customers, and how to support them. All of that is going to be turbo charged by AI.

What are some of the ways in which AI can help organizations?

The way to think about AI is it can do lots of things that previously you would give to humans to do. Imagine that on every customer support call you could have someone listen in and they could tell you what product or services the customer is interested in or whether the customer is getting angry. You could hire an additional rep to listen in on every call, but it wouldn't be cost effective and nobody does it. They end up recording all their calls and then they don't listen to those calls. So, AI can listen to those calls and answer all of those questions for you: are they getting angry, what products should we recommend to them at this point, are they about to turn and if they're about to turn what can we offer them, so they don't? Think of it as having an army of interns that can listen in to calls, read documents, look at pictures, or make predictions based on past history. That's what AI is going to be able to do.

Are you seeing a growing number of startups offering AI solutions?

Yes, basically all the startups that we find these days are AI startups. When we first started as a firm in 2009 nobody called themselves AI-powered. And flash forward to today, 80% of the startups we see call themselves AI-powered. So, it just shows the sea change that's happening. AI is rapidly becoming the must-have technology – like the iPhone app seven years ago. When we see a startup that doesn't have machine learning and AI, the first question we ask is 'so who's doing it with AI?'

The talent gap is only temporary

When the top tech firms are scooping up all the hot AI talent, what should traditional organizations do?

Every time there's a platform shift, there's a temporary shortage of talent as the ecosystem catches up to provide the top engineers with the right set of skills. When SQL first came out, there was a run on SQL developers. The universities weren't graduating them out fast enough, and the first ones were super expensive. And the same thing was true when the iPhone came out, because Apple in those days required that you write all iPhone applications in this weird language called Objective C that nobody knew. The Web was like that too – nobody knew HTML and JavaScript when the Web first came out. And so, every time there's a platform shift there's this temporary period where the developers are expensive and where there's not enough of them. But eventually the ecosystem catches up and it creates enough of them. So now there are tons of boot camps where you can go for three months and train yourself on the latest AI machine learning techniques.

When I took the CS221 'Intro to AI' at Stanford in the late Stone Age, there were 50 people in the course. This semester there are three 'intro to AI' classes. Each one of them has 1000 students. For context, Stanford has something like 6000 undergrads total, so one-sixth of the entire undergraduate population is taking one of the three 'intro to AI' classes. And so, the ecosystem is catching up fast and we won't have this sort of temporary imbalance of talent that we do now.

So, do you believe a combination of re-skilling/ up-skilling can help when it comes to developing AI talent?

> ***Large traditional organizations don't necessarily need the multi-million-dollar top AI researcher. They don't need to invent a brand-new AI algorithm or technique, they can just take the ones that are being invented and apply them into their business.***

Yes, that's exactly right. Every university is adding this set of techniques to their computer science curriculum and there are dozens of boot camps. It's also important to bear in mind that large traditional organizations don't necessarily need the multi-million-dollar top AI researcher. They don't need to invent a brand-new AI algorithm or technique, they can just take the ones that are being invented and apply them into their business. So, the great news is that those research engineers that go into Google, Apple, Facebook, and Amazon and so on, they are open sourcing what they're doing.

What I don't want is an industry executive to read a news article and conclude that since they can't afford a $10 million artificial intelligence researcher, they are just not going to do anything. That's the absolute wrong conclusion to draw. The right conclusion is, 'hey, those top multi-million-dollar researchers are open sourcing their stuff – that's fantastic. I can take an image of it without paying a million dollars.'

Sending motivated, curious people to get the Udacity Artificial Intelligence nanodegree is a 6 month, $1,600 investment. It's not 2 years and $100,000.

> ***Sending motivated, curious people to get the Udacity Artificial Intelligence nanodegree is a 6-month, $1,600 investment. It's not 2 years and $100,000.***

AI-native organizations treat data very seriously

So, what are some skills that traditional organizations should focus on developing?

Andrew Ng, who is one of the most well-known researchers in this space, has this really good analogy. In the early days of the Internet, even your neighborhood shopping mall had a website. But just because they had a website, that didn't make them an Internet company. The Internet retailer was Amazon. And becoming an Internet retailer required Amazon to master a lot of things. They mastered continuous development and deployment. They changed their website 100 times a day as opposed to the mall which changed it like once a year. They mastered A/B testing. So, they mastered all these things and that's what made them an Internet native.

The same thing is happening with AI. Just because you use AI techniques doesn't make you an AI native. As an AI native you're going to have to master a whole different set of skills. We don't know exactly what set of skills these are going to be yet, but there are a few early signs. An AI-native company is going to treat data very seriously – harvesting the data, feeding the data into algorithms, and labeling the data so that the algorithms can make accurate predictions.

.

> ***An AI-native company is going to treat data very seriously – harvesting the data, feeding the data into algorithms, and labeling the data so that the algorithms can make accurate predictions.***

Make AI a daily habit for your organization

What are some areas where partnership with AI-driven startups makes sense for large organizations?

Building AI tools requires consistency. You have to make AI a daily habit, because if you don't make it a daily habit your competitor will make it a daily habit. There are startups that offer tools for people who are building AI applications.

If you have a model that makes predictions, SigOpt, for example, can make that model better by automatically tuning it. Every model has a dozen or more knobs that you can turn and, depending on where the knobs are set, the model produces different predictions. There's an optimal setting for each knob. So, you can either pay a data scientist to basically trial the settings, or you can just use SigOpt, which will automatically put the knobs in the right place to make the best possible recommendations. So that's a tool that organizations can use to get the expertise in-house.

What are some low-hanging use cases for AI?

The low-hanging fruit is basically anywhere where you're making a recommendation, anywhere where you need to understand what people are saying, or anywhere where you need to recognize what's happening inside a picture. So, for example, having a chat interface to your brand so that people can chat with you on an automated basis. Low-hanging fruit would also be understanding text, pictures, a video, and making recommendations.

What about the more complex use cases of AI?

We have a lot of biology investments that are basically doing tasks such as taking blood samples inside your blood sample. In other words, free-floating DNA that's not bound to tissue and is just floating around in your blood stream. We can take that DNA and use it to predict whether you are going to get a specific type of cancer. So, compare that to the global standard today, which is you need a tissue biopsy. There's a company called Freenome that can do that without any tissue. For cancer, the most important thing that you can do is early diagnosis as survival rates are 90% when you find it early, but 10% when you find it late. So, the single most important thing you can do with cancer therapy right now is not to invent something for the 10% case. In general, most AIs are now likely to be as effective or more effective than the very best human diagnostics.

AI eats jobs, but fears of an AI takeover are overblown

AI is almost always spoken of in context of job losses. What are your thoughts on this?

Every category of automation eliminates jobs and creates jobs and this has been true since the very dawn of automation. When we invented the looms, a lot of weavers lost their jobs. Today, less than five percent of the population is involved with farming as compared to 80% at the turn of the century. My take on it is automation has displaced people, but it's always created new opportunities and AI is just one in a long line of automation technologies.

We didn't know we wanted iPhones until Steve Jobs showed them to us. Our capacity to want new things and new services is basically infinite. Therefore, if it's infinite, then somebody is going to emerge and service that need and create new jobs around it. I don't know why AI would be any different than any other automation technology. Some of the jobs AI will replace are also not work that anyone wants to do. For example, AI is going to eventually make it possible to automate strawberry harvesting. If you've been a strawberry harvester, you know that it's a miserable job. In general, that's good, as long as we can find the strawberry harvester another job, which I'm pretty confident that we'll be able to do, because we always want new jobs and new services.

My take on it is automation has displaced people, but it's always created new opportunities and AI is just one in a long line of automation technologies.

Premature to worry about super AI

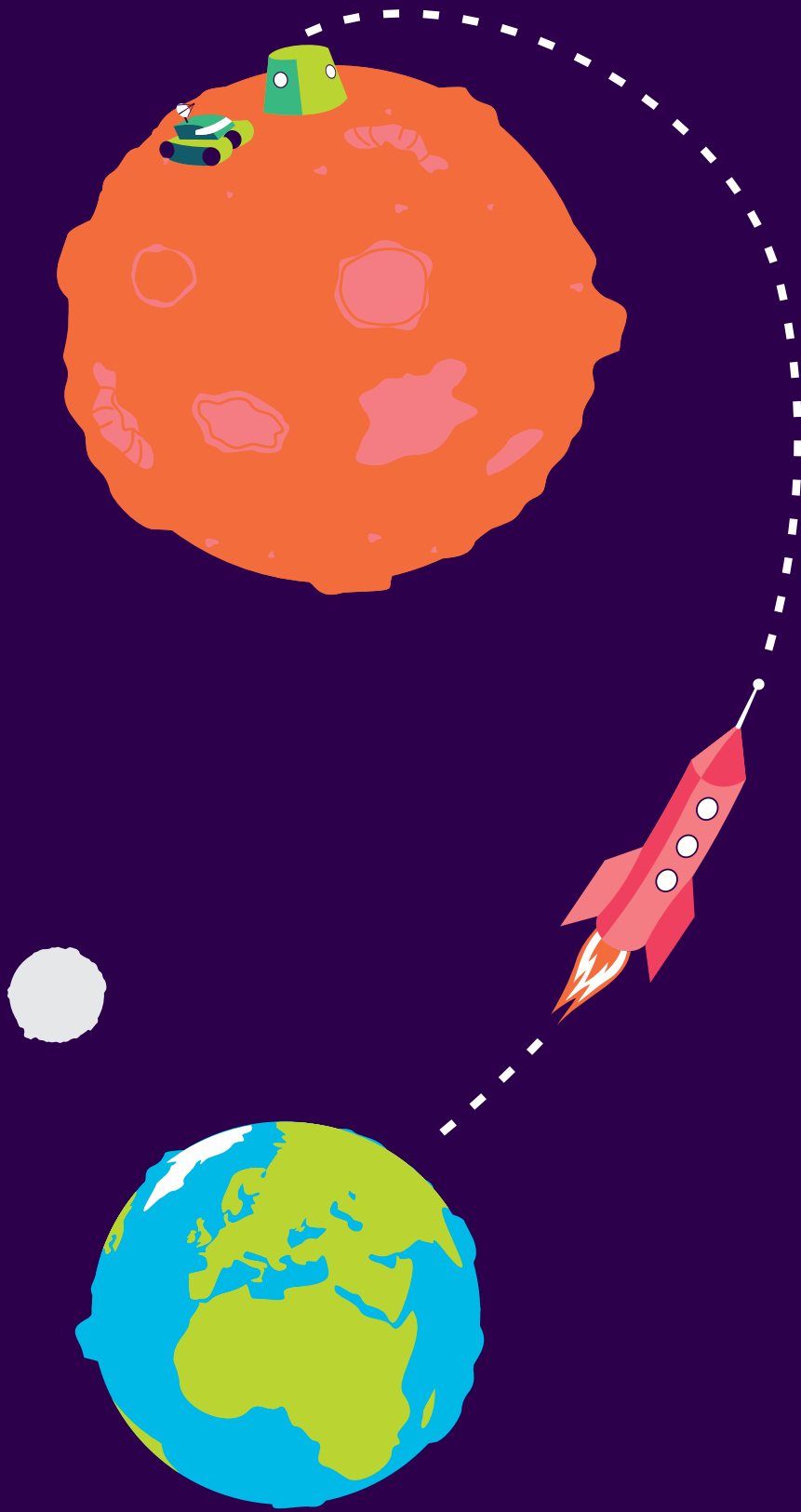
Elon Musk worries about World War 3 when it comes to AI. Machine learning researchers disagree. What is your take on the debate?

To frame that answer, let me describe maturity levels for AI. Everything that I've been talking about is what the research community calls narrow AI, which is very specific. Pinterest built something that can look inside a pin and figure out what's in it and what's similar to it. Those algorithms don't help Lyft to figure out the best route to take you from place A to point B. And then those Lyft algorithms don't help Freenome figure out if you have cancer. They're very task specific and that's why they're called narrow, they don't generalize. Even in these narrow fields there are lots of things that people can do that algorithms can't do.

The second sort of AI would be general AI. In other words, you and I can learn new things, like you can learn to ice skate, you can learn to do double-entry book-keeping, and you can learn to do machine learning and a lot more. AIs can't do that yet and there's no consensus in the research community about how you would build a machine that has this remarkable property that our brains have, which is the ability to do new things in new domains very quickly. So, we're not even on a path to really do that.

And then the third stage is what Elon Musk is most worried about, which is super AI and 'singularity', where AIs are better than humans at everything. At that point, there's no looking back, because computers are faster, have more memory, and are more repeatable, therefore making humans irrelevant. That seems very far away. As Andrew Ng says, it's like worrying about overpopulation on Mars. One day we might have to worry about that, but nobody is on Mars yet, so let's not worry about that now. Even in narrow AI there's a long way to go, so worrying about super AI seems a little premature.

> ***As Andrew Ng says, worrying about super AI where AIs are better than humans at everything is like worrying about overpopulation on Mars. One day we might have to worry about that, but nobody is on Mars yet, so let's not worry about that now. Even in narrow AI there's a long way to go, so worrying about super AI seems a little premature.***



AI Fallacies:

"As Andrew Ng says, [worrying about super AI] is like worrying about overpopulation on Mars. One day we might have to worry about that, but nobody is on Mars yet, so let's not worry about that now. Even in narrow AI there's a long way to go, so worrying about super AI seems a little premature."

3 stages of AI development:

Narrow AI:
Algorithms are very task specific and don't generalize – "Even in these narrow fields there are lots of things that people can do that algorithms can't do."

General AI:
Wherein machine can do multiple things; machines, currently, lack the ability to do new things in new domains very quickly.

Super AI and singularity:
AIs are better than humans at everything

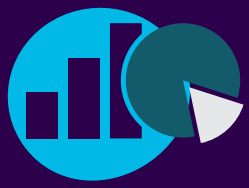
"Every time there's a platform shift, there's a temporary shortage of talent as the ecosystem catches up to provide the top engineers with the right set of skills."

Becoming an AI-native

An AI-native company is going to treat data very seriously:

Harvesting the data

Feeding the data into algorithms



Labeling the data so that the algorithms can make accurate predictions

"You have to make AI a daily habit, because if you don't make it a daily habit your competitor will make it a daily habit."

AI talent shortage won't be a problem in the near future

"What I don't want is an industry executive to read a news article and conclude that since they can't afford a $10 million artificial intelligence researcher, they are just not going to do anything. That's the absolute wrong conclusion to draw. The right conclusion is, 'hey, those top multi-million-dollar researchers are open sourcing their stuff – that's fantastic. I can take an image of it without paying a million dollars.'"

Democratizing AI for Traditional Businesses

Rajen Sheth,
Senior Director,
Product Management,
Google

Google

Rajen Sheth is Senior Director, Product Management currently responsible for running the Google Cloud Artificial Intelligence and Machine Learning product line. This includes products which bring Google's AI technology to enterprise customers and developers, including Google's AI platform, image, video, and speech AI capabilities.

Previously, Rajen was responsible for the Android and Chrome for Business and Education group, leading a cross functional team across product, engineering, sales, support, ops, and partnerships. Earlier, Rajen also co-founded and led the Google Apps product line, and Google's messaging and collaboration products for businesses. He was also responsible for leading Google's efforts to bring cloud computing to universities and enterprises.

Rajen holds a B.S. and M.S. in computer science from Stanford University. Capgemini's Digital Transformation Institute spoke to Rajen to understand how Google is democratizing AI.

Can you tell us a bit about your role at Google?

I'm the Director for our Google Cloud artificial intelligence team, where we bring Google's many AI technologies to bear for our customers and for developers. We do a number of things. At the infrastructure level, we bring the best of infrastructure for artificial intelligence to customers. At the developer level, we give developers access to a lot of the great models that we've developed for products as well as those built specifically for enterprise use cases. Thirdly, we provide solutions that meet specific business problems.

AI is going to be in every industry in ten years

What are some of the implications of AI for large companies?

I think the industry is still figuring out where AI can be most beneficial for companies. But I do see a number of areas. For example, we are seeing a particular interest and impact in personalizing customer interaction. It is always hard to give a customer a personalized experience when you have multiple customers that are coming to your website. AI can help give a much more personalized interaction–everything from recommendations to helping interact with the customer via customer service applications such as chatbots. AI can help in contextual impact, so that the customer can get the answer they need quickly. AI helps in marketing campaigns and loyalty programs as well. Another area is efficiency and agility. Spotting new patterns in a database can lead to strong efficiencies. Another area is adding structure to unstructured data.

Which sector do you believe will be most affected in the short term?

We are definitely seeing retail as an area where there is a lot of potential for AI. Everything from how you personalize a customer interaction all the way through to how do you rethink the concept of the store. For example, when you walk into a retail store, you are almost always anonymous. There's barely any of the personalization you might have if you go to the brand's website. There are ways that AI can help solve that and make the interaction with the customer a lot more personal. Within the next five to 10 years, almost every company will be using AI in a pretty significant way.

You don't need to know AI to benefit from it

For an organization to benefit from AI, where should it begin?

I think it should begin with the business problem. It should not start with the technology. It really starts with figuring out what business problem you want to solve and then figuring out how AI can be applied.

If top AI talent is going to companies like Google, how should large organizations meet the AI talent challenge?

> ***AI today is really where the Web and the Internet were in 1994. Everybody sees a lot of promise, but it is still very hard to build upon.***

Talent is actually the biggest limiting factor for AI right now. There are very few people that can actually build a deep learning model for example. I think it is a two-sided challenge. On one hand, how do you train more people to be able to do these things? On the other hand, how do we make AI easy and useful for organizations? This is where we are focusing. How do we make it so that the existing teams in organizations can leverage AI? Existing developers in traditional organizations shouldn't have to immerse themselves into the deep learning model in order to benefit from it.

AI today is really where the Web and the Internet were in 1994. Everybody sees a lot of promise, but it is still very hard to build upon. Back then, building a web page required a lot of know-how in terms of knowing HTML, for example. From there, we very quickly got to the point where any average business owner could put up a website and enable e-commerce. And that's where we need to get to with AI. The average business owner should have building blocks that they can put together in an easy way to be able to accomplish their needs without having to build models themselves. That is what we are focusing on – how do we bring AI to many more people, how do we democratize it?

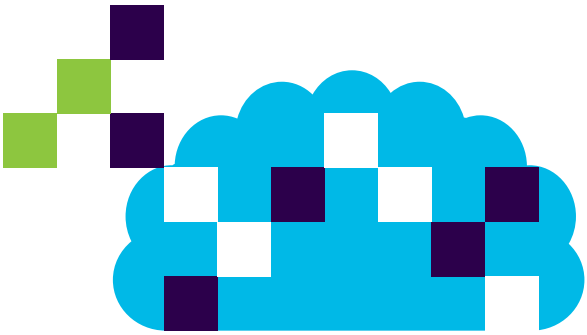
AI still has its issues

What is your view on the black box nature of AI?

In many cases it doesn't necessarily matter how AI came to a conclusion. The bigger question is about whether the conclusion is useful and ends up creating benefits? Take, for example, product recommendation. If AI recommends a particular product, the way you really test that is whether people buy the recommended product. Of course, there are many other areas where explainability is critical. For example, with medicine or fraud detection it is critical to be able to explain AI's decisions. That is something where the science needs to evolve a little bit more because these algorithms are fairly generic. Figuring out explainability is a challenge that the field needs to work out.

In your view, what are some of the issues with potential biases resulting from the data that is used to train AI?

That is a big issue. AI is fundamentally not biased, but if the data itself is biased, then it is going to produce biased outputs. That is an area where we as a field need to improve and figure out how we get to the right kinds of best practices. One thing that we observe is that the vast majority of work in building a great model is not actually in the model itself, it is more in the data. Figuring out what data to use, getting the data to the right place, cleaning the data, doing data engineering and feature engineering, and then figuring out what outputs you are looking for and how to use those outputs. That is the bigger challenge in almost any of these problems.



> ***AI is fundamentally not biased, but if the data itself is biased, then it is going to produce biased outputs.***

AI @ Google

Google has a variety of AI initiatives. How does the company view AI?

At Google, we emphasize that AI is not something that should be done by only one group. AI is something that should be pervasive. Over the last two years, we've gone from around a couple hundred projects at Google using AI to almost 7,500 projects. Sundar [*Sundar Pichai, Google CEO*] has already said we are an AI-first company. We've gone through a rapid transition to becoming an AI company where almost every product utilizes AI as a tool to provide a better user experience. The current level of interest in AI is like nothing I've seen before in my career.

Over the last two years, we've gone from around a couple hundred projects at Google using AI to almost 7,500 projects.

Which Google product do you believe AI will impact the most?

AI can have an impact on every Google product. I see AI as more of a paradigm of engineering as opposed to anything else. One of the best examples of AI at Google is Google Photos. All of us have tens of thousands of photos and categorizing them is a painful exercise. Google Photos really took that to the next level by bringing Google-quality search to photos. Translation is another big area. We just publicly shared a demo with the new Pixel 2 smartphone where, if you wear our ear buds, we can translate another speaker using a different language and give you the translation in your ear simultaneously. It is really magical because we can start to bring the world together. Another surprising application of AI for us has been the Gmail smart reply. With email on mobile, we suggest a reply at the bottom of each message. On mobile, that is extremely valuable, because typing something on a mobile phone is not an easy thing to do. We are now finding that over 10% of replies via mobile for Gmail use this smart request feature. Things like that are really showing that AI can not only be accurate but incredibly useful too.

How does AI help you differentiate Google Cloud?

AI is going to be a big differentiator for Google cloud in a number of ways. First is the infrastructure and making Google cloud the fastest place to run AI. Second is the building blocks – the prebuilt models that users can take and customize. We have a wealth of models and knowledge that are there for users to take and use. Third is partners: having partners build on top of this and offer services to customers is really how this can scale. We are putting a lot of emphasis on working closely with partners to make them successful.

What do you say to people that are worried about AI taking over the world?

AI is still a very nascent technology. We are still only a few years beyond being able to take an image and tell a dog from a cat. We still need to figure out how AI can best augment what we do. The big issue for me is one we spoke of earlier – bias. I think that is a more pressing issue than worries about taking over the world. If we are producing algorithms that contain biases, then that becomes a much bigger problem.

We are really at the beginning of a journey for something that is going to have a positive impact for people everywhere over the course of the next 10 to 20 years. It is up to us to figure out how best it will have an impact. I'm really excited about having this opportunity to really shape the next generation of technology.

Google an AI First Company

"Over the last two years, we've gone from around a couple hundred projects at Google using AI to almost 7,500 projects."

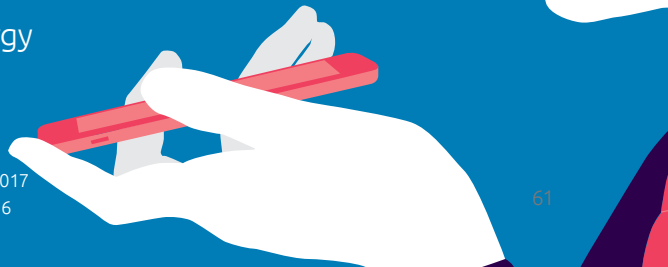
Google Photos provides Google-quality search to photos.

Google Translation
Pixel 2 smartphone provides real-time simultaneous translation of a different language via ear buds

Google Lens app for bringing up relevant information about everyday objects using visual analysis and AI[1]

Gmail Smart Reply
10% of replies via mobile for Gmail use smart request feature

15% - reduction in Google Data Centre's energy usage thanks to usage of DeepMind AI[2]



[1] Engadget, "Google Lens is a powerful, AI-driven visual search app", May 2017
[2] Guardian, "Google uses AI to cut data centre energy use by 15%", July 2016

AI: Already Delivering Measurable Results across Sectors

Babak Hodjat,
Co-Founder & CEO, Sentient Technologies

sentient

Babak Hodjat is a Co-founder and the Chief Executive Officer of Sentient Technologies. A serial entrepreneur, Babak has started numerous Silicon Valley companies as main inventor and technologist.

Prior to co-founding Sentient, he was Senior Director of engineering at Sybase iAnywhere, where he led mobile solutions engineering. Babak was also a co-founder, CTO and board member of Dejima Inc., which was acquired by Sybase in April 2004. He is the primary inventor of Dejima's patented, agent-oriented technology applied to intelligent interfaces for mobile and enterprise computing – the technology behind Apple's Siri.

He has 21 granted or pending patents to his name and holds a PhD in Machine Intelligence from Kyushu University, in Fukuoka, Japan. Capgemini's Digital Transformation Institute spoke to Babak to understand specific applications of AI across industries.

Building disruptive AI that delivers today

Can you tell us a bit about Sentient and your background?

I'm the co-founder and CEO of Sentient Technologies, where we scale AI to disrupt industries. We build products that disrupt industries and we're organized into three business units. One is in asset management, investment management or trading. The second is 'intelligent commerce' – the AI-enablement of the shopper journey. The third is digital media optimization – effectively building websites that adapt themselves to different users.

I have a PhD in Machine Intelligence from Kyushu University in Japan. In a past life, I set up a startup and I was the main inventor behind the National Language Conversational Technology, which ended up being the underlying technology behind Siri. A big chunk of my team went on to work at Siri, then became part of Apple, and now we have started this.

Are you already seeing some early benefits where you have deployed Sentient AI for clients?

Clients don't put money into this because it's some sort of 'magical AI'. For example, when we sell AI enablement for retailers, we are measured by indicators such as the increase in conversion rates or the average order value. Our business model is based on that approach and we are incentivized by the performance of our AI-enabled products. The same thing goes for digital media optimization. The user defines the measure – such as conversion rates online – and that's what we're optimizing, and we show where we actually improved on that. AI is doing that, but how we get paid is a function of that improvement.

Can you tell us more about how AI delivers benefit in commerce?

> ***We took AI and we had it learn what there is for sale so that it has a full understanding of everything that this e-commerce site offers.***

E-commerce has really not changed significantly in the past decade or more. If you want to buy something online, your experience is more or less the same. You go online you see pages upon pages of seemingly randomly ordered images of what you're looking for. You then have to scroll through it until you find what you want, or you have to put in lots of filters and so forth. It's cumbersome, difficult and it's been a failure. The reality is that online conversion rates are at around 3%, which translates to a 97% failure rate.

So how do you change that? An AI-enabled shopping assistant interacts with you and through that

interaction, you can quickly find exactly what you're looking for. We took AI and we had it learn what there is for sale so that it has a full understanding of everything that this e-commerce site offers. The AI then sits in-between that understanding it has developed and the user. Within a few clicks, users get to exactly what they're looking for.

We have deployments for example with Sunglass Hut or with Skechers, and in these cases, we have seen 30 or 40% improvements in conversion rates. Not just that, we've also been able to increase the average order value which is an indication that the users are actually finding what they're looking for and therefore, the order value is going up. There's this anecdote that users at any given point in time, are only seeing about 10% of the inventory. Post our AI deployment, 75% to 80% of the inventory is actually seen by the users because the users are directed and are helped by the AI to navigate the sites.

> ***Post our AI deployment, 75% to 80% of the inventory is actually seen by the users because the users are directed and are helped by the AI to navigate the sites.***

Can you explain how AI-based trading works?

The AI makes all the decisions from what instruments, how to trade it, whether to go long or short, how long to hold, how much to buy and when to cover or sell. All of these decisions are made by the AI. The AI-based desks have certain risk and return profiles. That depends on the appetite of the investor in the fund.

The AI can very much optimize for different outcomes. These are problems that we call multi-objective problems, which means that we're actually solving for more than one objective rather than only solving for making money. The AI is solving for making money while reducing risk and, by doing so, there are multiple solutions to a multi-objective problem. You could have a high-risk but high-return solution that is acceptable for a certain class of your customers, and you could have another solution that is much more conservative with, of course, lower returns. So, when you give the AI a multi-objective problem, rather than coming back with a single solution it gives you a spectrum of possible, acceptable solutions. Based on that, you can actually market different offerings depending on the appetite of your customers.

Getting AI off the ground

How do you measure the ROI from an AI deployment?

In the case of digital media or intelligent commerce, it's pretty straightforward, because organizations already have the cost of acquisition for a user. So, when a user hits a website in e-commerce, every click is a cost and bringing the user to the page is a cost. So, the larger the percentage of people that convert, the less the cost of conversion. And, of course, the increase in conversion – or an increase in Average Order Value – means more revenue for the organization. We measure that improvement as reflected in dollars. In the case of digital media optimization, there's also the traffic. Here, our business model is currently called a traffic-based business model. Depending on the traffic on the site, you have a different value to that site. So, if we can improve the value of the conversion relative to the traffic, then we can improve on that particular KPI.

In trading, it is very straightforward and just like any other hedge fund. We're measuring consistency of returns through time and it depends on the appetite for risk with the different desks. Our model is very similar to a hedge fund model, where there is a commission and percentage of the returns. It's commonly known as the 2-20, but it could be variations of that, so 2% management fee, 20% of the returns.

How do you train the AI and how much time does it take?

Building an AI product is not trivial. It takes a lot of effort and work and we're getting better and better at it. Today, it's a matter of weeks to get from signing an agreement to actual deployment. The actual custom work is maybe 5% or lower, because for most of these categories that are being sold online, we already have models. The whole thing is very much industrialized so that we can manage multiple customers at the same time as on-boarding them and taking new inventory and changes on a daily basis.

How should a large organization go about deploying AI?

I don't think of AI as a one-size-fits-all kind of a solution. I don't think a big organization would ever say, "We're going to standardize and AI-enable everything". This is because the AI-enablement for different aspects of the organization is going to manifest itself very differently. So, you're going to have multiple AI-enabled products, each one applied to a different aspect of an organization. There are companies that are starting to think strategically about AI. The usual way is to identify the two or three different areas where it's fastest to deploy an AI solution and then move to a wider-scale deployment.

A bright future for AI

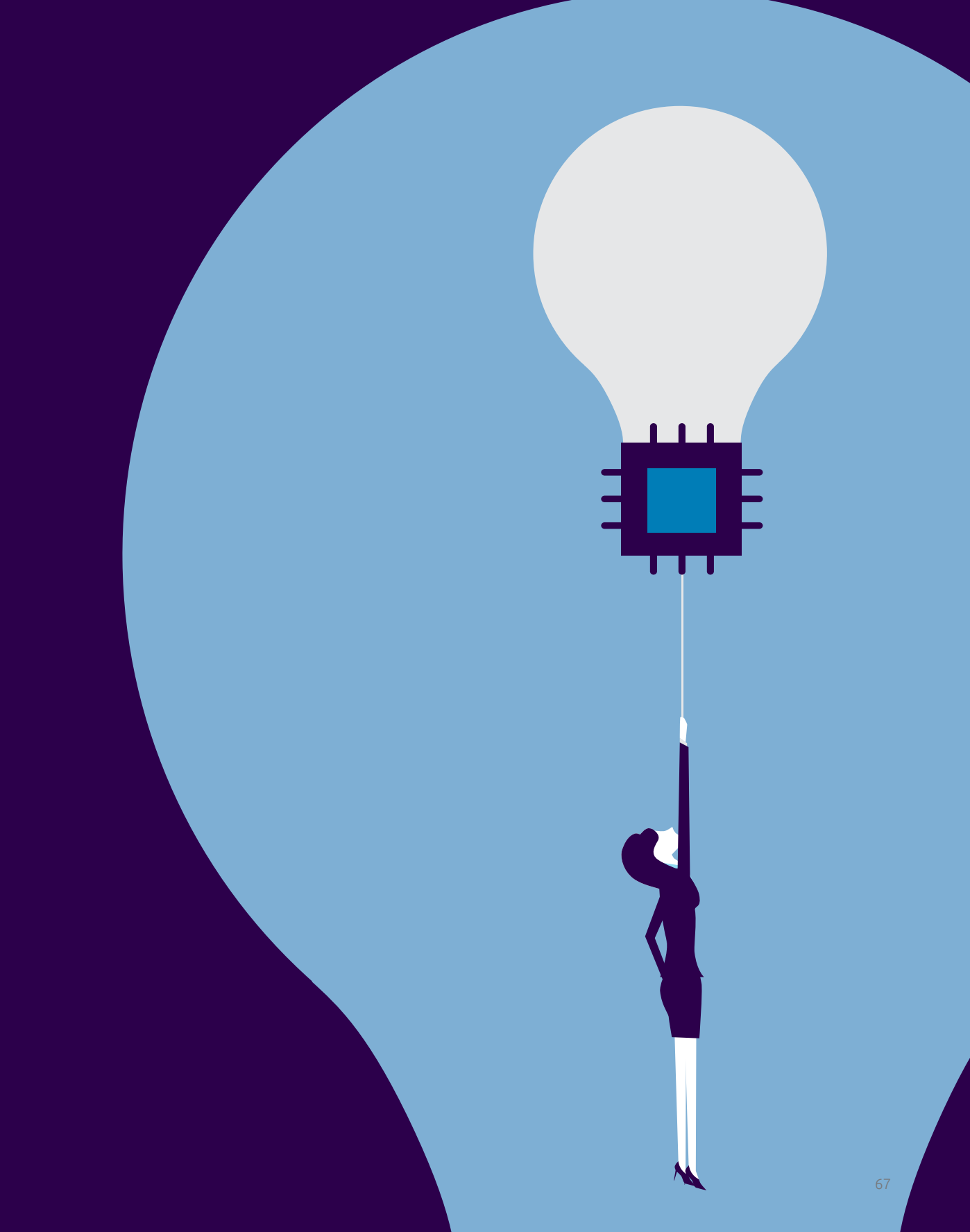
Which sectors do you think are conducive to AI?

We believe that AI has very broad applicability. For example, there's a lot of AI being applied in healthcare these days. but not too many people looking at agriculture. But we have been working with OpenAg at MIT Media Lab and undertaking some projects where the AI would discover recipes for how to grow plants and environmentally control situations. For example, we see that the AI is discovering how to grow plants – deciding which spectrum of light to shine, the humidity, water levels, and minerals to be added. You can actually optimize for taste, believe it or not. I wouldn't say there's an industry in which AI is not right for disruption.

> ***AI is discovering how to grow plants – deciding which spectrum of light to shine, the humidity, water levels, and minerals to be added. You can actually optimize for taste, believe it or not.***

How do you see the future of AI?

I think AI is going to become more and more ubiquitous in products across many different industries. We will see a lot of AI though in many instances we will not recognize it as AI. It's just going to be natural – you will interface with it without knowing it is AI. I think AI has a bright future in things like the IoT, in agriculture, healthcare, and across many different enterprises such as banking and insurance. AI will also manifest itself in what we more commonly know as interfaces for robots. Robotics is an industry that's very much hardware-originated and the interface, therefore, has always been kind of neglected. I think we will come to a point where the best interface to robots are going to be conversational and augmented so that the robot can actually perceive its surroundings. There is a very bright future for AI.



Using AI in e-commerce

"E-commerce has really not changed significantly in the past decade or more. […] The reality is that online conversion rates are at around 3%, which translates to a 97% failure rate."

"We took AI and we had it learn what there is for sale so that it has a full understanding of everything that this e-commerce site offers. **The AI then sits in-between that understanding it has developed and the user. Within a few clicks, users get to exactly what they're looking for."**

Impact of AI in e-commerce

30 or 40% improvements in conversion rates (e.g. Sunglass Hut and Skechers)

Increase in the average order value showing that clients are finding what they are looking for

Higher visibility of inventory to users (from 10% to almost 75% to 80%)

Tech Leaders

AI – Augmenting, Not Replacing, Human Intelligence

Rob High,
IBM Fellow, VP & CTO, Watson

Rob High is an IBM Fellow, Vice President and Chief Technology Officer, IBM Watson. He has overall responsibility to drive Watson technical strategy and thought leadership. As a key member of the Watson Leadership team, Rob works collaboratively with the Watson engineering, research, and development teams across IBM. Prior to joining the Watson team, Rob was Chief Architect for the SOA Foundation and member of the IBM Academy of Technology.

Capgemini's Digital Transformation Institute spoke to Rob to understand how AI is permeating across organizations of all sizes and how it is being used.

IBM Watson

What will be one of the biggest changes that AI will bring to everyday experiences?

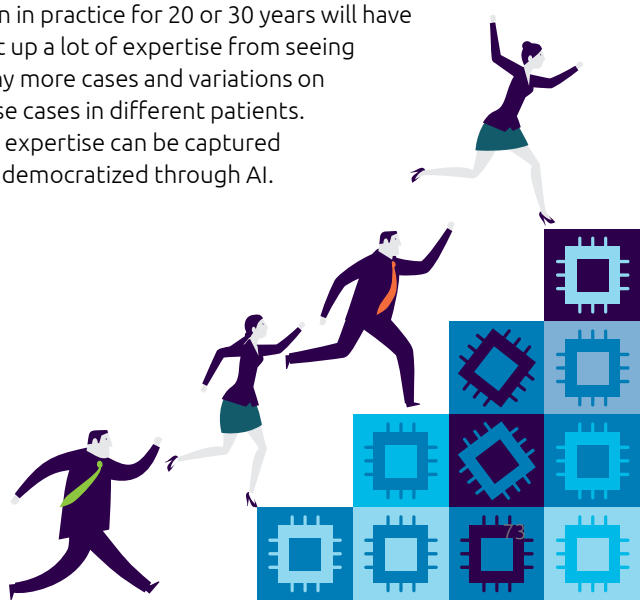
This goes to some basic fundamentals of human–machine interfaces. If you look at the history of computing, for the last 70 years of modern computing, humans have essentially had to adapt to the constraints of the computer. The human–machine interface has always been defined by constraints in how the computer is capable of expressing itself, from punch cards in the early days to sliders today. They are still largely defined by forms of interactions that are not natural to human beings. So, one of the benefits that AI can bring to the table is a much more natural form of interaction. If the AI is already able to understand our language, what we hear, and what we see, then the next logical step is for us to begin to improve the way that it interacts with us. This is an area that will be most interesting to watch when we think about the application of AI in solving real-world problems.

> ***One of the benefits that AI can bring to the table is a much more natural form of interaction.***

Helping people be better at what they do

How can large organizations benefit from AI?

The primary benefit comes from helping people who do things today, do those things better. One practical way is where AI helps you consider more sources of information, in a world where the amount of information that we are exposed to is growing exponentially, and far exceeds the capacity for us to possibly consume and assimilate. If you are an organization that has a very large call center, for example, where you are having to deal with very large numbers of customers who come to you for support or advice, then having a cognitive system can help significantly. For instance, you can augment call center staff by offloading some of the more mundane tasks. Call center advisors can do a better job in answering clients' questions and concerns by finding information that would otherwise be difficult to access. Cognitive systems can also help companies where there is significant diversity of expertise across the organization. For instance, doctors who have been in practice for 20 or 30 years will have built up a lot of expertise from seeing many more cases and variations on those cases in different patients. This expertise can be captured and democratized through AI.



Which industries are best-placed to benefit from AI?

Currently, the healthcare industry recognizes the need to get this kind of assistance for their cognitive processing. Doctors know that it is very difficult for them to keep up with the very latest advances in their domain. They have therefore reached out very aggressively to adopt systems that make better treatment decisions or improve their ability to diagnose. Among other industries, financial services definitely has an interest. For example, financial advisors spend a lot of their time researching different investment choices for their clients, and that is a process that requires a lot of reading. It requires going through a ton of information. The more that they can get assistance from the cognitive system, the more information they can assimilate to make better decisions for their clients. Retail is another industry where I believe AI can significantly enhance customer interaction.

Get the use case right

Where can AI provide most benefit? Are there specific categories of data where AI can have greater impact?

One of the unique characteristics that AI brings to the table – which traditional computing doesn't – is its ability to look at, and understand, human expression. By this, I mean things like text or literature and audio and video. To date, this data that has largely been the unique domain of human expression, and this is where AI has a tremendous opportunity to make a difference. In general, any place that has qualitative information that, up until now, has largely been ignored because of the limits of computational systems to understand it.

How should organizations go about implementing AI?

I believe it is always important to start with the use case, because the use case is going to then tell you how much work you have to do to get ready and also something about the value that you will get from having invested your time and energy. When you have a use case that you are ready to invest in – and it is well defined, scoped, and targeted – then you begin to look at the most effective way of evolving through that use case. You start to think of the minimum viable product that you need to create in order to get started and yield some of the benefits. You start there and grow. But if you don't have the use case, and you don't know the value of it or the market conditions associated with it, that makes it hard to answer any other questions.

Most popular use case: the contact center

> *The most popular use case right now is in the contact center. There is just so much room for improvement in the customer experience, the abilities of the agents involved, and the relationship between the institution and its customers.*

What do you believe are the top use cases for AI?

The most popular use case right now is in the contact center. There is just so much room for improvement in the customer experience, the abilities of the agents involved, and the relationship between the institution and its customers. I see that as being an area of massive growth in the world of AI. It dramatically transforms the contact center industry, but more importantly the relationship between institutions and their clients.

Bot first, or human first?

If it comes to deciding whether to deploy a bot, or a human, how should an organization go about it?

There are a couple of different schools of thought. One is that you always send your clients to the bot to begin with, but build into the bot the ability to detect when the user wants to opt out and go directly to human. This approach is similar to the evolution I think we have seen in the IVR space. Many institutions are now forcing you to their IVR, and then in the IVR there is an option to talk to a human. The other approach is to make that choice available as different entry points into your organization. So, for example, you could have a web page where you are selling a product, and you have a catalogue of all the products in your store, and you deploy the ability to both chat with a bot or chat with human being there and let the customer make their choice.

Some of that has to do with the nature of the customer base you are dealing with. For example, there are a whole category or people in certain parts of the world that prefer to deal with a chatbot. To them, it seems anonymous and also gives them freedom to ask what they believe are silly questions and not be judged by a human being on the other end. Older people under certain circumstances may prefer to talk to a human being. So, by giving them that choice, people can go for the option that is most useful and comfortable for them. The third case is when you always talk to human beings. In this case, you really need to give AI to the agent and help them do a better job serving their clients. The idea is to make their client service consistent, more efficient, and with better quality of information.

You don't need to be an expert in AI to benefit from it

If finding AI talent is a significant challenge for many organizations, how should companies develop AI capabilities?

I don't think you need to be an expert in the technology of AI to benefit from it. You don't need to be skilled in AI, you need to be skilled in your use case. Now, that is not to say there aren't going to be cases where you need to build your own algorithms. But I think there are a lot of things that people can do with AI services that enable them to support the use case without having to know all the details of how that AI works.

> *I don't think you need to be an expert in the technology of AI to benefit from it. You don't need to be skilled in AI, you need to be skilled in your use case.*

How do you see AI impacting on jobs in the future?

I think that there will be some displacement of jobs, but I think for every job lost, there will be many more jobs that are gained. The role of AI is not to replace humans, it is to augment humans. It is about helping us be better at what we do; it is not about doing what we do. It means that in every job that is out there, where there is room for improvement, there is going to be a room for AI to improve the job, and make people better at what they do. So, it will be incumbent upon people to determine for themselves whether they want to take advantage of the benefits of AI. If they refuse, they are going to be at some risk. But for everybody else that want to improve themselves, they are going to find that AI actually makes their job better and easier to perform at a higher level. In the end, it is really about how we augment human intelligence, not about how we replace human intelligence.

> *I think for every job lost, there will be many more jobs that are gained. The role of AI is not to replace humans, it is to augment humans.*

"For every job lost, there will be many more jobs that are gained."

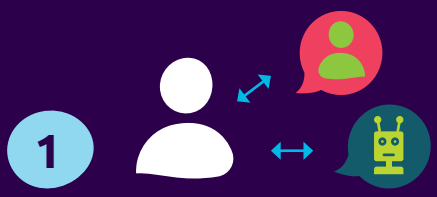
How should organizations go about implementing AI?

Start with the use case

Consider one of most popular use cases: the contact center

Augment call center staff by offloading some of the more mundane tasks

Two approaches to familiarizing clients to machines



1

Send clients to bots, but equip them to detect in case users would like to be directed to humans

2

Make that choice available as different entry points into your organization (e.g. web page for selling a product, with an ability to chat with a bot or human being)

The Need for a Long-term AI Strategy

Lili Cheng,
Corporate Vice President, AI and Research division, Microsoft

Microsoft

Lili Cheng is a Distinguished Engineer and Corporate Vice President of the AI and Research division at Microsoft. Lili is responsible for Microsoft's AI Developer services such as Bot Framework and Cognitive Services. Lili founded the Social Computing Group in Microsoft Research & Future Social Experiences (FUSE) Labs, was the Director of User Experience for Microsoft Windows, and innovated on technical infrastructure in the areas of real time data and search.

Prior to joining Microsoft, Cheng worked in Apple Computer's Advanced Technology Group on the User Interface research team, where she focused on QuickTime Conferencing and QuickTime VR. She has also taught design at NYU and Harvard University.

Capgemini's Digital Transformation Institute spoke to Lili to understand her views on AI and what it means for large organizations.

Experiment, experiment, and experiment

How can AI help large organizations?

We believe there are two broad areas. One is about B2C and the other is about how people get work done inside a company.

Let's start with the first area. For example, if I want to interact with my insurance company today, it is still pretty hard to get basic help for some of the tasks that I want to do. One area we have been focusing on therefore is customer support: helping companies answer both simple and more complex questions and working with them to improve the way they reach their customers.

The other area is how people get work done inside their companies. We are focusing on how people work on projects, manage email, schedule their meetings, communicate via messaging, and so on. We believe AI can be of significant help here. Take this very discussion for instance. We should be able to have a more dynamic way of understanding the context quickly. I need to go into my mail, find the right email, and quickly look at a couple of other things before I come into the discussion. Then, we have to figure how to record this interaction and take notes and follow up. People spend so much time in meetings and it it's an area of dissatisfaction for many because they often feel it's not the best use of their time. We are thinking about how to improve the intelligence when people come together in groups.

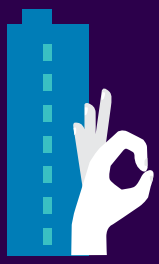
How should large organizations approach AI?

> ***The rate at which companies and researchers are sharing and open sourcing their technology is really unprecedented.***

The rate at which companies and researchers are sharing and open sourcing their technology is really unprecedented. It is great because it means you will have more people who actually have domain expertise and can author and create intelligence. We don't want people to have a PhD in AI to benefit from it. The tools need to be usable by people with different skill levels. The person actually using the tool is probably one of the best people to design it.

> ***We don't want people to have a PhD in AI to benefit from AI.***

Where can AI help?



How **people get work done** inside a company

"We don't want people to have a PhD in AI to benefit from it"

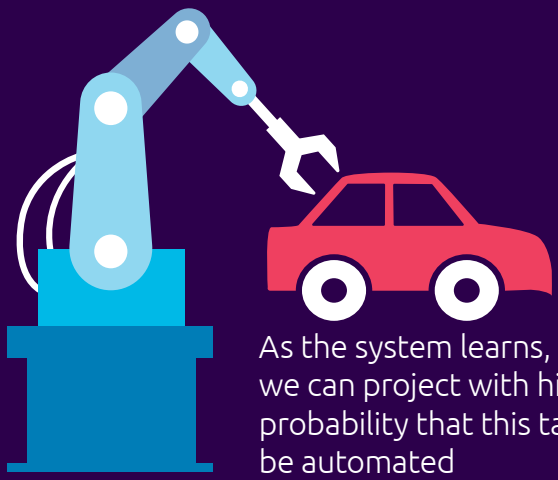
AI Imperatives

Better data

Ability to quickly experiment

Bot or Human?

In the beginning it's particularly important to have people to override, train and manage the system



As the system learns, then we can project with high probability that this task can be automated

What are some of the areas where AI can have the most impact?

The areas where we think companies will want more intelligence is in managing the financial data flow – who your customers are, what they are doing, who has paid their bills and so on. Customer support is obviously a big area and another really interesting area is time management. We recently acquired a start-up called VoloMetrix. They look at workplace satisfaction: how people spend their time; how satisfied they are with their job; how much time do they spend on meetings and email and what is the best way to help people be more proactive and spend their time more meaningfully? In a certain sense, computers have taught people to be very distracted. One of the things that could therefore be really interesting is how AI can help people manage their time more effectively.

Computers have taught people to be very distracted. One of the things that could therefore be really interesting is how AI can help people manage their time more effectively.

What should organizations bear in mind when they deploy AI solutions?

The one thing you need is simply better data. Having the data so that you know where you are and the top three scenarios for where you want to be.

Being able to experiment quickly with some customers before building the entire system is also really critical. This is because if you want the perfect AI solution it can take a while to get all your data, integrate it and roll it out. Also, there'll be times when the things that your customers want are going to change. A year ago, for example, people were a lot less interested in speech. Today, I think people feel the need to not just have text-based solutions, but also speech-based solutions. So, I think being able to experiment quickly, and have an experimental group that can try things out ahead of the entire organization will be crucial.

How should organizations decide what should be driven by a bot versus what should be driven by a human?

When you first roll out your system it is not going to be very smart because it doesn't have that much data. In the beginning it's therefore particularly important that you have people to override, train and manage the system.

When you first roll out your system it is not going to be very smart because it doesn't have that much data. In the beginning it's therefore particularly important that you have people to override, train and manage the system. But over time, as the system learns, then we can project with high probability that this task can be automated. At that point you can automate it and your people can focus on complex tasks, new areas, or things that are more ambiguous.

We are better prepared for the onset of AI than any other technology in the past

AI will likely impact on jobs. How do you believe organizations should approach it?

I think that organizations should know that their people are probably their most valuable asset. Without your employees and your customers, you don't have a business. So, making sure people's jobs are interesting is really critical. I also think it's really important to be aware of why you are automating and which new opportunities you need to go after.

We have been focusing more on areas that are still fairly hard to automate and, so I don't think that we are seeing job displacements. But I do think that it's something that companies and governments need to work on together to ensure we all understand the impact.

What do you see as the future for AI?

It's important to remember that every technology has changed the workforce. If you think of the Internet, the ability to access the world's information instantly has changed a lot of jobs. With AI, compared to other technologies, we are probably more mindful of the impact on how work may change. I think it is our responsibility to make sure that it is augmenting how people work. We need to ensure that people can spend their time more effectively and we are really committed to that. We are all thinking a lot more about this than we thought about, for example, the Internet. We didn't have these conversations when the World Wide Web was emerging, because I don't think people really had the foresight to think about how it was going to transform the way everybody works and lives. This time around with AI we are a little bit smarter to be asking these questions earlier.

> ***With AI, compared to other technologies, we are probably more mindful of the impact on how work may change.***

What separates companies that understand AI?

An AI-native company is going to treat data very seriously – harvesting the data, feeding the data into algorithms, and labeling the data so that the algorithms can make accurate predictions.

Frank Chen,
a16z

Those organizations that are reaping the benefits today started thinking about AI up to eight years ago. They began building the proper foundations from a data platform perspective.

Babak Hodjat, Sentient Technologies

The AI that will be successful is not the one I want, it is the one that I want again because of what it makes me not do, or what it enables me to do.

Luciano Floridi,
University of Oxford

AI leaders have a policy and process around data governance and treat data as an asset.

Michael Schrage, MIT

AI: Automating, Accelerating and Improving Decision-Making

Amr Awadallah,
Co-Founder & CTO,
Cloudera

Amr Awadallah is the Chief Technology Officer of Cloudera. Before co-founding Cloudera in 2008, Amr (@Awadallah) was an Entrepreneur-in-Residence at Accel Partners. Prior to joining Accel he served as Vice President of Product Intelligence Engineering at Yahoo!, and ran one of the very first organizations to use Hadoop for data analysis and business intelligence.

Amr joined Yahoo! after they acquired his first startup, VivaSmart, in July of 2000.

Amr holds a Bachelor's and Master's degrees in Electrical Engineering from Cairo University, Egypt, and a Doctorate in Electrical Engineering from Stanford University. Capgemini's Digital Transformation Institute spoke to Amr to understand how organizations can benefit in their decision-making using AI.

cloudera

How would you define AI and what level of take-up are you seeing?

I prefer to see AI as the automation of decision-making as opposed to 'intelligence'. It's about learning about multiple areas and then making decisions like a human does, but in a much quicker, faster, more reliable and more accurate manner. So, it is really about the automation of decisions.

We have more than 1,000 customers worldwide. But I would say only a handful are truly undertaking compelling AI implementations and automating decisions in a unique way. Most companies are still just figuring out how to collect, sort and catalogue their data.

Make sure there's a problem that AI can solve

Do you think organizations understand AI's potential?

> ***Many organizations are very excited by the buzz but don't really understand what it means. It is important to understand the limitations of what can and cannot be done with AI.***

I don't. Many organizations are very excited by the buzz but don't really understand what it means. It is important to understand the limitations of what can and cannot be done with AI. A significant reason for the confusion is the name 'intelligence', because it is not really about intelligence. It is actually about process and decisions. It is about learning how certain processes and decisions work within the organization and then automating them.

What does it take for organizations to deliver benefits from AI and make a success of their programs?

The first imperative is making sure you have the proper systems and the right skills. The second is ensuring that you identify the initial use cases that can benefit from AI, as opposed to just adopting AI for the fun of adopting AI. You need to have a very well-defined use case or a very well-defined problem that AI can help solve.

The benefits are there, but realizing them requires hard work

What differentiates the companies that benefit from AI?

> ***Those organizations that are reaping the benefits today started thinking about AI up to eight years ago. They began building the proper foundations from a data platform perspective.***

What differentiates them is the first-mover advantage. Those organizations that are reaping the benefits today started thinking about AI up to eight years ago. They began building the proper foundations from a data platform perspective. They started training their people in the skills required. Now, eight years later, they are at the point where they are truly able to leverage AI.

There is a kind of basic hierarchy of needs or processes that organizations need to go through. For example, they need to be able to collect data and different types of data across their organization, including real-world data. So, having more sensors and technologies that bring in that data from the real world is the top priority. Number two is processing that data. Being able to manage, process and clean it up at scale is still something that most organizations struggle to do. Then you start with basic analytics, gradually moving to advanced analytics and then AI. The last step is the most advanced, which is to automate. Depending on the organization, this stage can take anywhere from two years if they are very fast or as much as eight years.

What is holding organizations back from embracing AI?

It is a combination of two things – a proper data infrastructure and skills. The automation of decisions is dependent on having massive amounts of data that you use to train the algorithms and undertake the automation. But most organizations don't have very good hygiene levels when it comes to data management. In terms of skills, the skills that most organizations have are very focused on business intelligence, but it's a discipline that's very reactive in nature. Here, you are automating reports that a human needs to read to make a decision. That is the very different skill set of automating decisions, which requires training to bring people up to speed.

What should large organizations do about skills?

One thing is clear – large organizations are not going to be able to just hire people who are good at AI, because they are very hard to find. The best thing to do is to train your existing people. Another way of working around the skills challenge is to develop an AI ecosystem, where a wider spectrum of companies can tap into the power of AI.

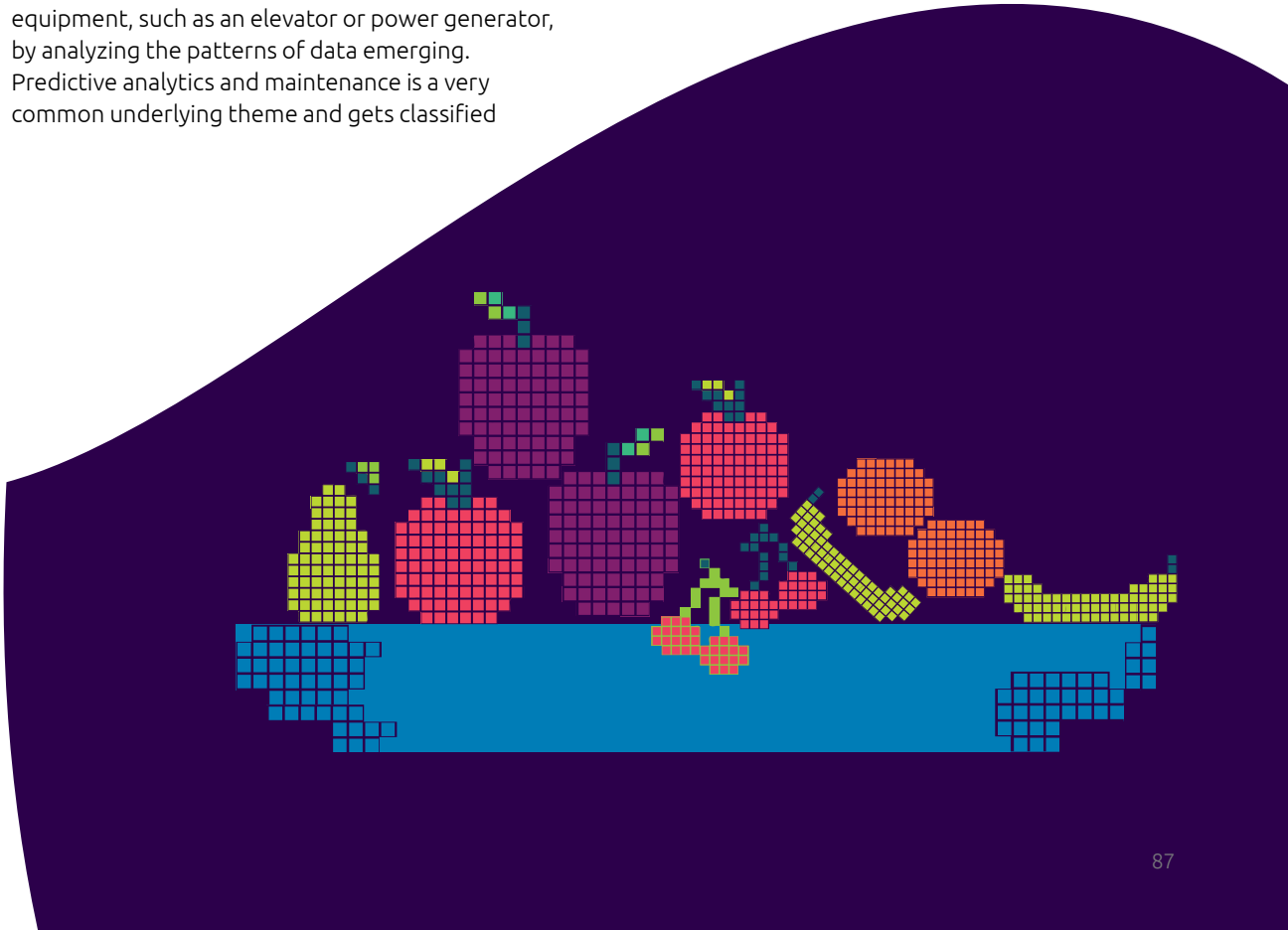
Every decision is ripe for AI

Are there specific sectors where you believe AI will see greater adoption?

We are seeing across-the-board adoption. Typically, you have more agile, innovation-ready sectors like finance and telecoms, but we are seeing appetite in many sectors. We are seeing it in power, smart grids and utilities. We are seeing it in manufacturing. We are seeing it in shipping, for companies that manage big fleets of ships across the world. Multiple sectors are very receptive and understand the implications of AI.

Are there particular business functions that are more suited to AI?

Any function where humans make repeatable decisions can be impacted by AI. It is applicable to a lawyer reviewing a contract to a doctor making a diagnosis. Another area is prediction. For example, predicting ahead of time the failure of a piece of equipment, such as an elevator or power generator, by analyzing the patterns of data emerging. Predictive analytics and maintenance is a very common underlying theme and gets classified under the AI umbrella. Another function is anomaly detection – trying to detect weird behavior or patterns within an organization. For example, a bank trying to detect patterns to counter money laundering.



The future for AI

How long do you think it will take for AI to become mainstream?

In the enterprise software arena, as opposed to consumer electronics, everything takes time to mature. It is not going to be like smartphone adoption. Based on historical experience, I would say five more years.

What is your view on the impact of AI on jobs?

In my view, AI is not replacing jobs. It is replacing decisions that certain jobs make. Take the example of lawyers I provided earlier. You will require less lawyers, but you will still require lawyers. We will need lawyers to review the exceptions – the challenging cases that the AI system cannot automate. Any new technology introduces new levels of efficiency and we as humans have to adapt. This was true with the industrial revolution. When we created the steam engine and the electric engine, a lot of people had to re-train. There will be a lot of efficiencies that will have a significant impact on many jobs, but jobs are not being completely eliminated.

What are some of the skills that people will need to survive in the AI age?

Firstly, skills around maintaining, operating, training and overseeing AI systems to ensure they are working correctly. The other important skill that will be required across all sorts of jobs would be the willingness to learn new skills. That is because expectations will change significantly as machines start to take on more and more decisions from humans.

In the enterprise software arena, as opposed to consumer electronics, everything takes time to mature. It is not going to be like smartphone adoption. Based on historical experience, I would say five more years.

The rate at which companies and researchers are sharing and open sourcing their technology is really unprecedented.

Lili Cheng, Microsoft

Is there a talent gap when it comes to AI skills?

Sending motivated, curious people to get the Udacity Artificial Intelligence nanodegree is a 6- month, $1,600 investment. It's not 2 years and $100,000.

Frank Chen,
a16z

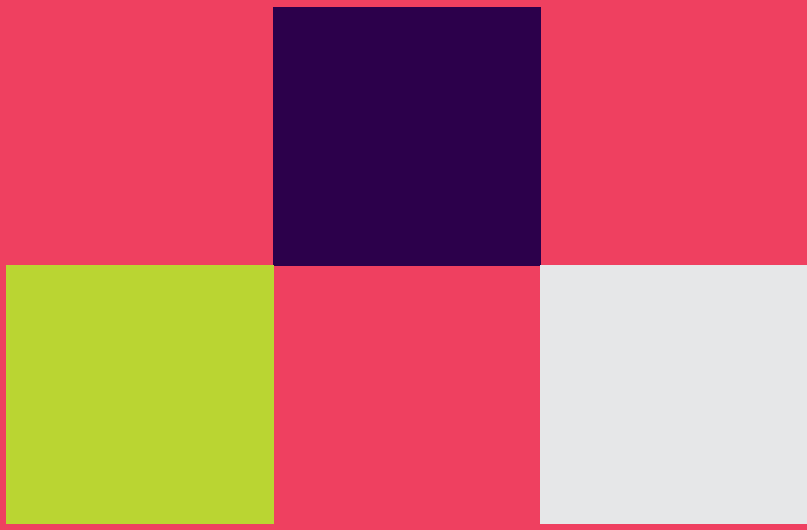
Nobody knew HTML and JavaScript when the Web first came out. And so, every time there's a platform shift there's this temporary period where the developers are expensive and where there's not enough of them. But eventually the ecosystem catches up and it creates enough of them.

Frank Chen,
a16z

The skills involved with AI and machine learning are in demand, yet we have been successful in recruiting talent. That's because the automotive industry is one of the best places for real applications that will influence how millions of people live.

Atif Rafiq, Volvo

The Capgemini Perspective



Turning AI Into Concrete Value:

The Successful Implementers' Toolkit

A report by Capgemini Digital Transformation Institute

"Organizations are now convinced of the benefits that AI can bring. They are now asking themselves where and how they should invest." **Gordon Schembri** Principal Digital Technology, GE Oil & Gas.

This research is a pragmatic guide to help organizations in their AI investment decisions. We analyzed more than 50 AI use cases regarding their adoption, complexity, and benefits. We surveyed senior executives from nearly 1,000 organizations around the world that are already implementing AI; see the research methodology at the end of the paper for more details. We also spoke to academics — as well as AI-focused executives at global companies, startups, and vendors — to gather perspectives in four areas:

- What concrete benefits are organizations seeing from AI today?
- What use cases are bringing the most benefits?
- Where should organizations invest?
- What steps are essential to getting started with an AI strategy and roadmap?

50
AI use cases analyzed

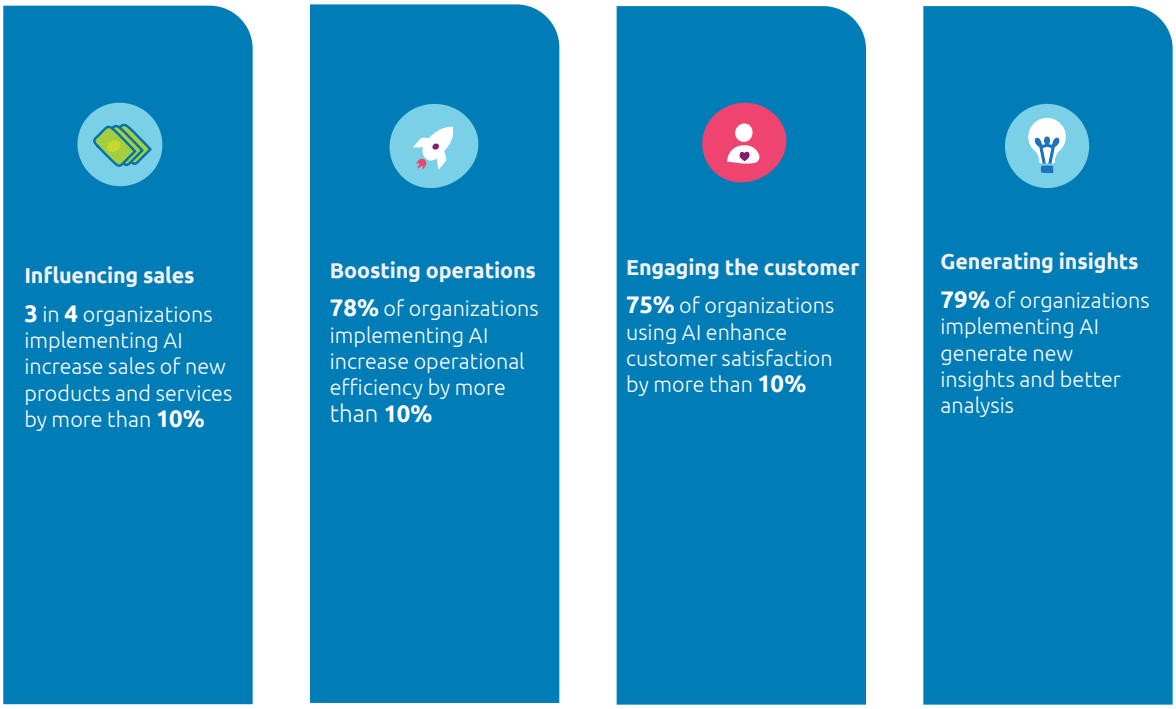
Benefiting from AI now

"We had the computer revolution, the smartphone revolution, and the Internet revolution but AI will probably be the biggest technological shift we have ever seen." Edouard d'Archimbaud, Head of Data & AI Lab, BNP Paribas.

Our research shows that AI is already transforming how organizations do business, manage customer relationships, and stimulate the ideas and creativity that fuel groundbreaking innovation (see Figure 1).

1,000
organizations implementing AI surveyed

Figure 1. How AI is driving benefits across the organization



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

AI is boosting sales

Cosabella, a luxury lingerie retailer, has moved to an AI-managed marketing platform. This smart platform automates digital advertising and marketing efforts, such as targeting a high-value audience and driving paid search ROI. In a three-month pilot, the platform produced a 336% return on ad spend (ROAS) and a 155% increase in revenue (Q4, 2016). Before they shifted to the AI platform, social media accounted for 5 to 10% of Cosabella's paid ad revenue. Since the adoption of the platform, social media consistently accounts for 30%. Cosabella's CEO says:

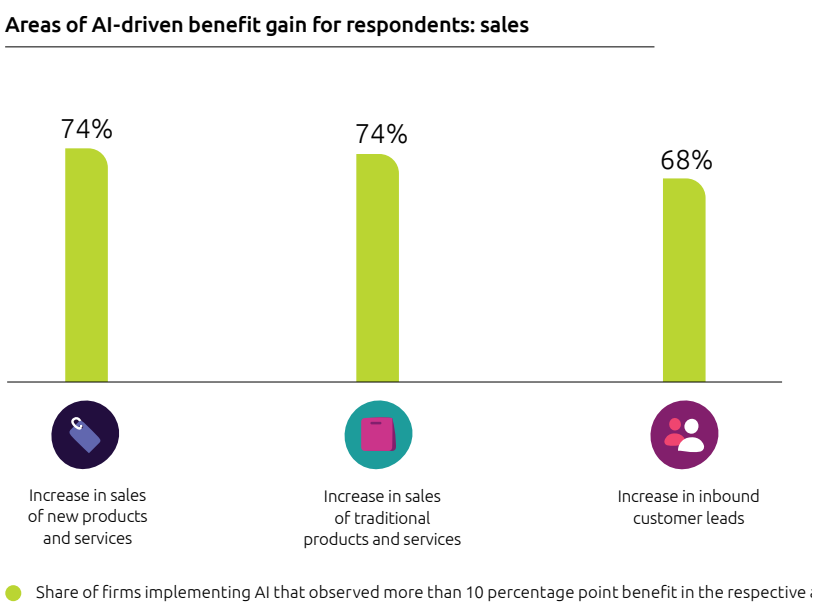
"…I would never hire a human to manage the technical aspects of our ad campaigns ever again. We'll leave the tech stuff to the tech and hire humans for the high-level strategic and creative."[1]

Our research shows that organizations are using AI to influence sales in a variety of ways, from supporting new products to generating leads (see Figure 2). Harley-Davidson, for example, used AI for highly targeted marketing activities, identifying customers who shared the attributes of previous high-value customers. The AI tool helped generate leads and also analyzed thousands of campaign variables to identify what worked and what didn't. This helped increase sales leads by 2,930% within three months.[2]

2,930%

Increase in sales leads experienced by Harley-Davidson using an AI tool in three months

Figure 2. Driving sales performance through AI



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

[1] BusinessWire, "Cosabella's Move To AI Moves a Lot More Lingerie," March 2017.

[2] HBR, "How Harley-Davidson Used Artificial Intelligence to Increase New York Sales Leads by 2,930%," May 2017.

What is Artificial Intelligence?

Artificial Intelligence encompasses a range of technologies that learn over time as they are exposed to more data. The definition we used in this report is that AI includes speech recognition, natural language processing, semantic technology, biometrics, machine and deep learning, swarm intelligence, and chatbots or voice bots. Figure 3 below summarizes most of the prominent technologies that are classified as AI.

Figure 3. Series of key technologies commonly classified as AI

Source: Capgemini Digital Transformation Institute Analysis

AI is transforming operations

Our research shows that AI delivers significant transformational benefits, from reducing churn to increasing regulatory compliance. More than 7 out of 10 organizations surveyed for this research are gleaning significant benefits in various areas of operations (see Figure 4).

Examples include:

- At JP Morgan, lawyers spent thousands of hours studying financial deals. Now, an AI system is doing the challenging job of interpreting commercial-loan agreements, taking on a task that has swallowed 360,000 hours of work by lawyers and loan officers. The AI system reviews documents in seconds and is less prone to error. The system has cut down on loan-servicing mistakes, many of which originated from human error in interpreting 12,000 new wholesale contracts per year.[3]
  A similar experience is highlighted by Mohammed Marikar, Director of Intelligence & Automation at Royal Bank of Canada: **"The role of the system is to augment human analysis. AI offers the ability to scale our capacity 10,000-fold of human analysis and scale back as and when needed."**
- Siemens has developed a neural network-based AI to optimize the combustion processes in their flagship gas turbines. The system has, in tests, already bettered human experts. After an expert set the turbine manually to minimum emission, AI took control of the combustion unit. Within two minutes, it reduced the emission value further by 20%.[4] Jonas Albertson, Managing Director, Atlas Copco—a Swedish industrial tools and equipment manufacturer—says: **"Typically, when you move to more autonomous solutions, you gain >20% productivity improvement at the lower cost."**
- Mastercard intends using AI to improve the overall accuracy of real-time approvals of genuine transactions while reducing the number of false declines. Mastercard estimates that the value of false declines is over 13 times greater than the total amount lost to actual card fraud and that a third of customers stop shopping at retailers after being falsely declined. By using AI, Mastercard hopes to reduce the overall number of false declines, and thus help their retailer partners.[5] Stephen Epstein,

Figure 4. Organizations are seeing benefits across operations, sales, and customer service

20%

Improvement in emission value by AI over a manual setting at a Siemens gas turbine

Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

[3] Bloomberg, "JPMorgan Software Does in Seconds What Took Lawyers 360,000 Hours," February 2017.
[4] Siemens, "Brains in Every Burner," February 2017.
[5] Company website.

VP Product Marketing at Digital Reasoning—a leading AI company—resonates with the thought: **"The most immediate improvements are— there is a dramatic reduction of false positives and in operational costs associated with those false positives."**

AI is engaging the customer

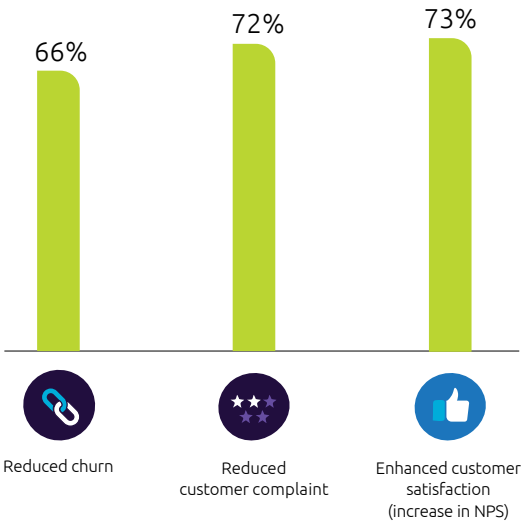
KLM, the Dutch airline, adopted an "AI-assisted human agent" model to reinforce their existing customer support staff. Using voice biometrics, the system can identify over a hundred human vocal features to instantaneously authenticate and process a call. The AI agent can also solve customer queries over a variety of digital platforms, adapting the reply based on the inquiry platform. For instance, it will reply in prose in an email, but use fewer than 140 characters if the query comes from Twitter. Overall, it has resulted in 35% efficiency gains and about 30% of KLM cases are now resolved through the AI platform.[6] Chief Data Officer at one of the world's leading telcos who we spoke to for this research explains how AI creates value in customer engagements: **"As AI deployment takes away some of the repetitive work, it allows organizations to spend more time on real customer engagements and trying to understand what customers really want."**

Organizations across sectors are increasingly seeing the benefit of using AI to improve customer engagement. More than 1 in 2 organizations (59%) agree that AI is supporting customer intimacy, and AI initiatives have helped more than 6 in 10 organizations increase customer satisfaction and reduce churn (see Figure 5).

As AI drives operational efficiency, it allows employees to spend more time focused on the customer. Fidaa Chaar, Global Head of Client Services, Société Générale, says: **"Operational efficiency frees up time that we can dedicate to focusing on added-value tasks such as the customer relationship."**

Figure 5. AI is improving how organizations engage with customers

Share of organizations implementing AI that observe more than 10 percentage point gain on the following benefits



Source, Capgemini Digital Transformation Institute, State of the AI survey, N=993 companies that are implementing AI, June 2017

35%

Improvement in customer service efficiency at KLM using an AI platform

[6] Forbes, "How Artificial Intelligence is Transforming Enterprise Customer Service," February, 2017.

AI is generating new insights

Nearly three-quarters of companies say that AI brings new insights, improves data analysis, and helps them make better decisions (see Figure 6).

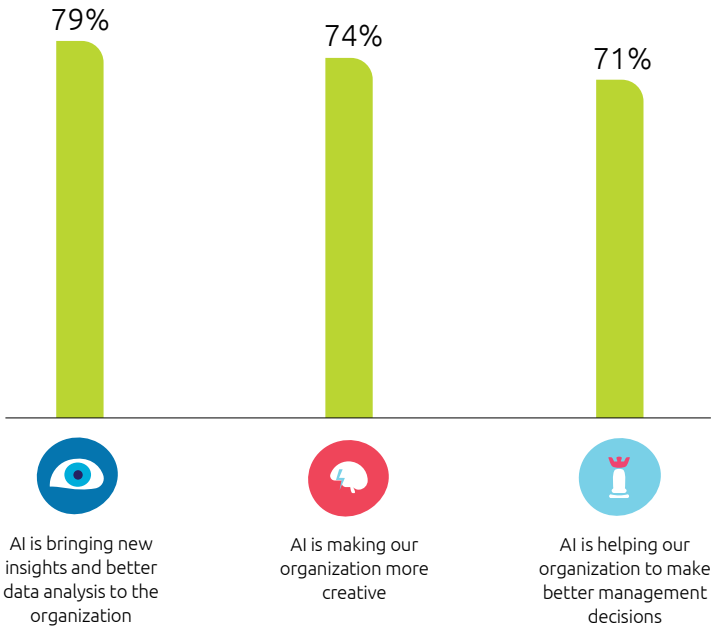
It also makes the organization more creative. For George Sarmonikas, AI Lead at Ericsson, this is a result of AI's ability to automate routine tasks. **"Artificial Intelligence automates some of the repetitive tasks of the engineer. Now those engineers can dedicate more time to tasks that require more creativity,"** he says.

74%

Share of organizations implementing AI believe that AI is making their organization more creative

Figure 6. AI is bringing new insights and making organizations more creative

Share of organizations implementing AI that are able to achieve the following benefits



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

Has the negative impact of AI on jobs been blown out of proportion?

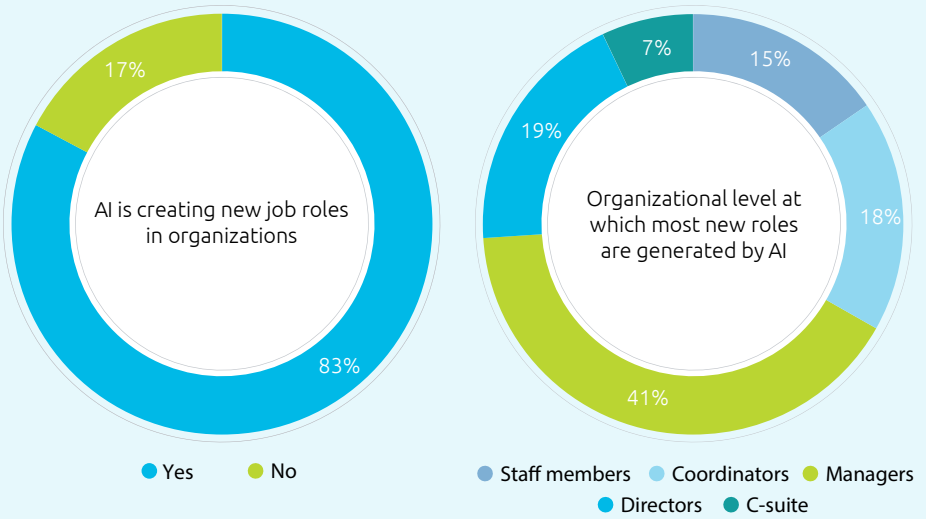
History teaches us that, in the long run, technology creates more jobs than it destroys. For instance, the advent of ATMs was largely expected to decimate the role of the bank teller. But between 1970 and 2010, the number of bank tellers in the US increased from around 300,000 to around 600,000.[7] By lowering their operating costs, ATMs allowed banks to open more branches, and thus drove the need for more tellers. Similarly, since the 1980s, the advent and extensive use of spreadsheet software has skyrocketed demand for jobs that leveraged such software. For example, management analyst and financial manager jobs have quadrupled to 2.1 million since 1983—this is a job category that wasn't even being tracked earlier.[8] The number of accountants and auditors has grown by 41% since 1985 even as demand for traditional bookkeepers, and accounting and auditing clerks fell by 44% in the same period.

The CTO of a large, multinational technology firm agrees:
"I think for every job that is lost, there will be many more jobs that are gained. The role of AI is not to replace humans, it is to augment humans. It is about helping us do what we do better." From our research, the near-term outlook in particular is positive.

AI is creating new job roles in many organizations. Four out of five executives in our survey of large organizations say AI has created new job roles (see Figure 7). Most of the new jobs are also at a senior level. Two in three new jobs (67%) were being created at the grade of manager or above.

AI is augmenting human output and hasn't negatively impacted jobs. A majority of organizations (63%) have not seen AI produce a negative effect on jobs. Among organizations that have implemented AI at scale,[9] more than

Figure 7. Four out of five organizations say AI has created new roles in their organizations



4 out of 5 *organizations say AI has generated new roles*

Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

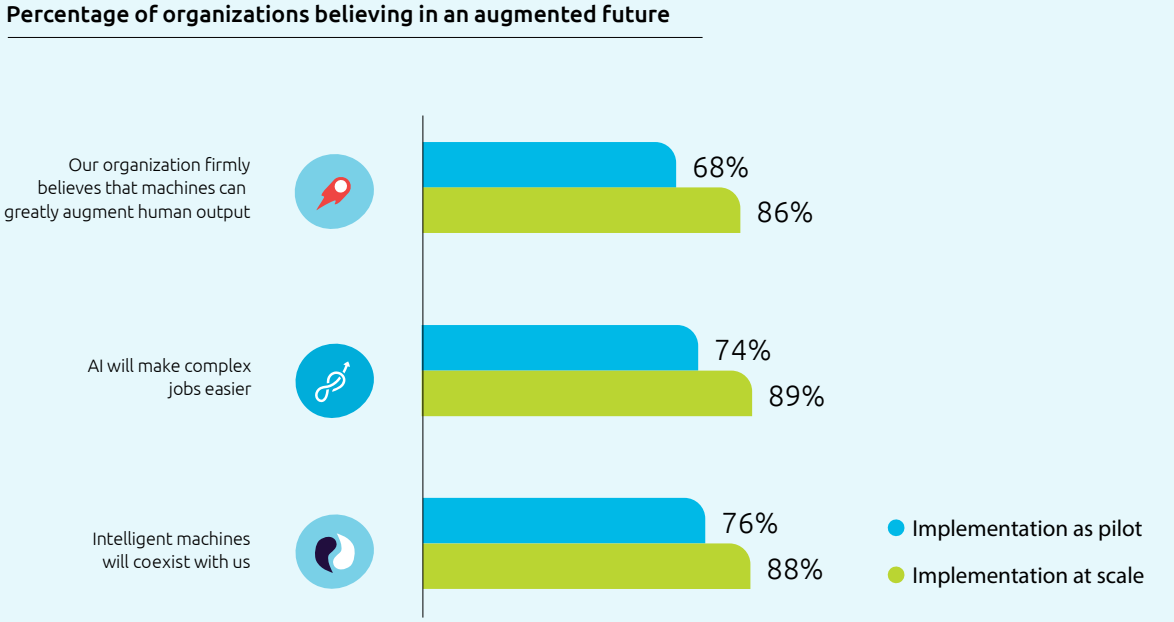
[7] AEI, "What the story of ATMs and bank tellers reveals about the 'rise of the robots' and jobs," June 2016.
[8] The Wall Street Journal, "We Survived Spreadsheets, and We'll Survive AI," August 2017.
[9] By implementing at scale, we refer to implementations that go beyond small pilot and test projects and are adopted at a larger scale in an organization across business units, functions or geographies.

three in five (63%) said that AI has not destroyed any jobs in their organization. This is in line with what several industry executives we spoke to said. Mohammed Marikar, Director at Royal Bank of Canada says, **"A lot of commentary confuses AI success in very narrow fields, such as playing Go, with the general intelligence needed to carry out most jobs. The reality is that the most advanced systems are yet to demonstrate anything approaching what we would consider 'common sense' and cannot operate without human direction."**

In fact, most organizations, as Figure 8 shows, see machines as complementary to humans. They also believe that AI will make complex or difficult jobs easier. An executive from a mining company we spoke to pointed out that new technologies make it easier to attract employees. This is because they can rely on autonomous vehicles, robotics, and smart analytics to run their mines and employees do not need to be physically co-located in the often uncomfortable terrain.

Of course, organizations will need to support their people in this new future through skills training. We found that 71% organizations have proactively initiated up-skilling and re-skilling employees with new skills to deal with the impact of AI. As the CTO of a large, multinational technology firm says: **"Organizations should not think in terms of how AI displaces their workforce, but how to improve the reach of their workforce. And we, as employees, need to learn and understand how we can make ourselves better with the additional benefit we get from augmentation."**

Figure 8. Organizations believe in co-existence of AI and humans



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

Use Cases: Organizations are missing a bigger opportunity by ignoring the low-hanging fruit

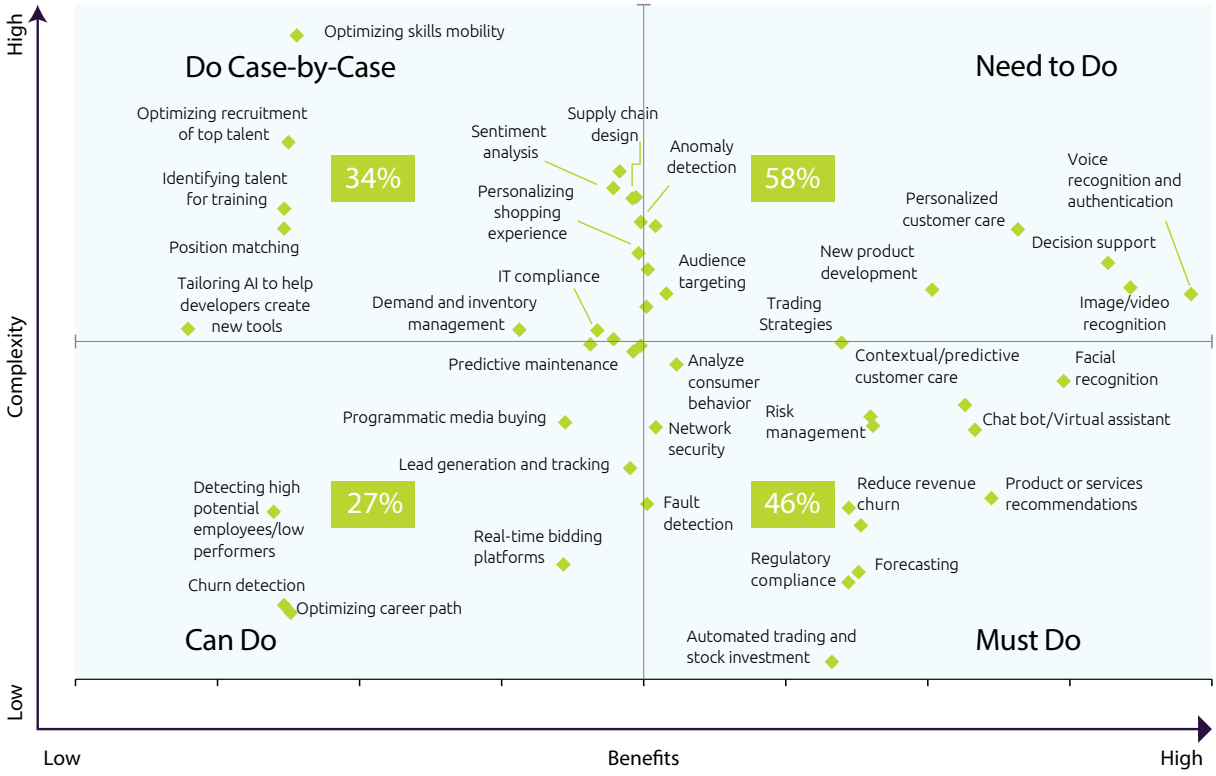
Our analysis of the implementation of over 50 AI use cases shows that many organizations are jumping straight to some of the most challenging use cases. However, only small minorities are focusing on use cases that are not only easy to implement, but have a high benefit upside.

As Figure 9 shows, we segmented the use cases by their complexity and the benefit upside that organizations can expect to see. We found that many organizations are currently tackling the most complex and high-benefit AI use cases:

58%

Average share of organizations implementing a high-complexity and high-benefit use case

Figure 9. Distribution of use cases by benefits and complexity

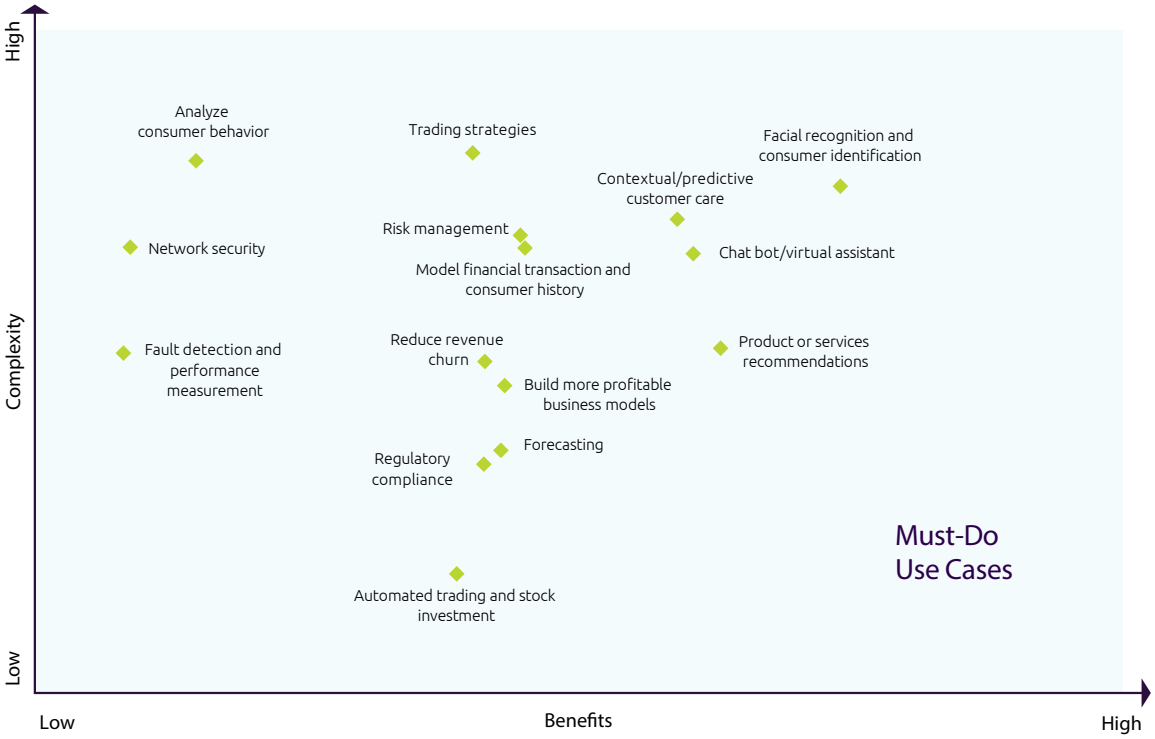


Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

20%

Share of organizations implementing AI who deploy "must do" use cases at scale

Figure 9. Distribution of use cases by benefits and complexity (cont'd)



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

- Over half of organizations (58%) are tackling "need-to-do" use cases (those defined by high complexity and high benefit).
- However, fewer (46%) are tackling what we call "must-do" use cases, which are low-hanging fruit in the sense that they are of high benefit but low complexity. Only about a fifth (20%) of companies are implementing "must-do" use cases at scale.

Neglecting these "must-do" AI initiatives—that span sectors—is a missed opportunity. Examples of these use cases include:

- Fault detection and performance measurement: At a leading global mining company, quality issues were detected too late during the manufacture of aluminum tanks. By using an AI-based predictive model, the organization was able to optimize product quality, yield, and energy consumption. The company was also able to better predict product quality, and product lifecycle with 70% accuracy.[10]
- Automated trading: UBS recently implemented a program for dealing with clients' post-trade allocation requests. The system scans client emails, looks for details on how they want to divide large block trades between funds, and then processes and executes the transfers. This would take a typical investment banker about 45 minutes, but the system can do it in less than two minutes. This frees up bankers' time for more value-added activities.[11]

[10] Capgemini Client.

[11] Financial Times, "Robots enter investment banks' trading floors," July 2017.

Getting started with an AI strategy and roadmap: key steps

Start by identifying your AI leadership

The journey begins with identifying a leader to spearhead AI initiatives: ideally a CXO who reports to the CEO. Our research shows that organizations with a dedicated AI head outperform firms with no clear leadership (and all AI initiatives running disparately) in several benefit areas. For instance, firms with a dedicated AI lead observed a 17% increase in inbound customer leads using AI vis-a-vis just 9% increase for firms having no clear AI leader. Only about a third (37%) of organizations implementing AI have a dedicated AI head or lead in their firm.

Set up a governance structure for AI initiatives to drive greater benefits

A clear governance framework is essential to secure AI's full potential. Our analysis shows that a central governing body for AI implementation increases benefits in multiple areas. However, only about 37% of organizations implementing AI have a central team that decides which AI initiatives will be implemented.

37%

Share of organizations implementing AI that have a dedicated AI leader

Win over employee trust and support by allaying their concerns

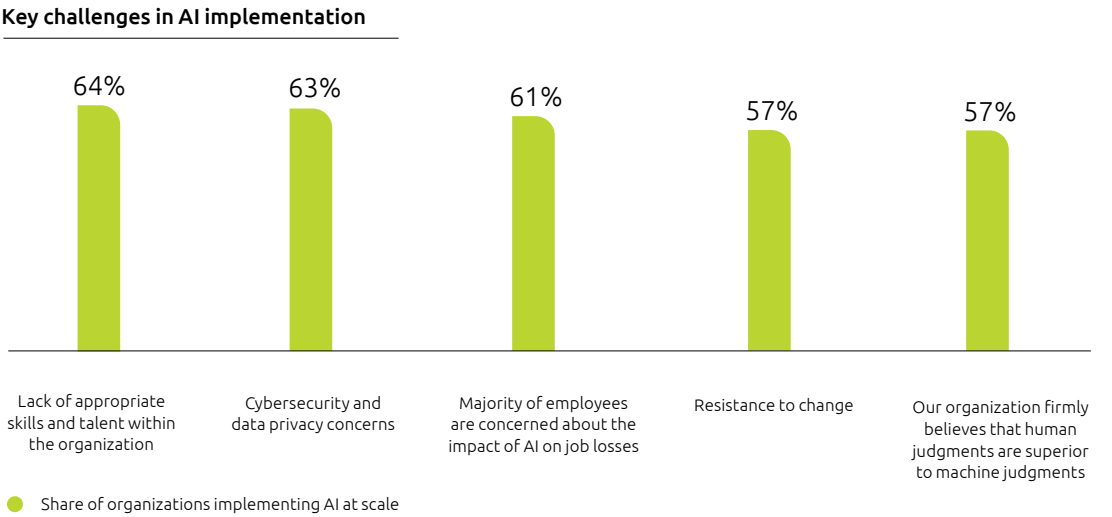
As organizations look to harness the power of AI, they must overcome a number of challenges (see Figure 10). The main cultural issue to sway is employee concerns about the impact of AI on jobs. In our survey, 61% of organizations believe that the majority of their employees worry about AI's role in potential job losses. It makes employees anxious about working with machines or AI applications and fuels resistance to change—another major hurdle in AI implementation.

Leaders avoid falling into this trap by openly communicating with employees and involving them at each step in the journey. They demonstrate how AI will augment employees' work and how training and other programs will increase their comfort level with the technology. For instance, Michael Natusch, Global Head of AI at Prudential, told us: **"We are running a training program for employees from all BUs to learn Alexa programming skills. The primary objective is not to develop AI solutions, but we are trying to increase the level of confidence that our colleagues have with AI. We hope to build an understanding of what those things can, and cannot do, as both of them are obviously equally important."**

17% vs. 10%

Increase in inbound customer leads observed by firms with a central governance team vs. no clear governance for AI initiatives

Figure 10. People and cultural issues dominate the top challenges in AI implementation



Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

Prepare enterprise data and skills to harness AI's full potential

Building a team of AI specialists who can conceptualize AI use cases, code, and implement them, is vital. Nearly two-thirds of organizations (64%) consider the lack of skills to be the biggest challenge to AI implementation. Ashwini Ashokan, CEO and Co-founder Mad Street Den—a computer vision and Artificial Intelligence startup—says: **"I do not think the world has enough people that know how to build AI. There is an extreme scarcity of talent right now."**

Similarly, the availability of data to train and test AI systems is critically important. Insufficient or irrelevant data jeopardizes the accuracy of AI applications, rendering them unreliable and unusable. Senior Director, Marketing, at an open source deep learning platform benefits puts it as: **"For a company to be successful, I think I will always go back to having a data science team and having the readiness for data and for data analysis. I believe organizations who only look at their current business model without even paying attention to data, usually lag behind."** Chris Nicholson, Co-founder and CEO, Skymind—a data analysis and machine intelligence start-up—agrees: **"Leaders understand that AI is much more than just tuning an algorithm, so you have got to be gathering the data that is relevant to your problem."**

Our research shows that organizations with the right combination of data and skills derive significantly greater benefits from AI than those who have yet to develop them.

"I would say leaders truly understand the differentiating value of AI, because they have already brought in people that understand the principles of AI and understand how to potentially apply AI to their organization. The big differentiator is that leaders are already investing in data science while others are not." reflects Stephen Epstein, VP Product Marketing, Digital Reasoning—a cognitive computing and AI startup.

Conclusion

For the business community, Artificial Intelligence has spent a frustratingly long time in hype mode. These complex and cutting-edge technologies promised to deliver so much, but for a long time real evidence of their concrete application in a business context proved elusive. This is now changing. With explosive data growth, increasing computer processing power, and strengthening AI technology foundations, leading businesses are putting AI into practice, generating enviable results. We hope you have found this thought-piece a useful and practical guide for taking this technology from hype into reality and creating a long-term, sustainable approach to generating concrete value from AI.

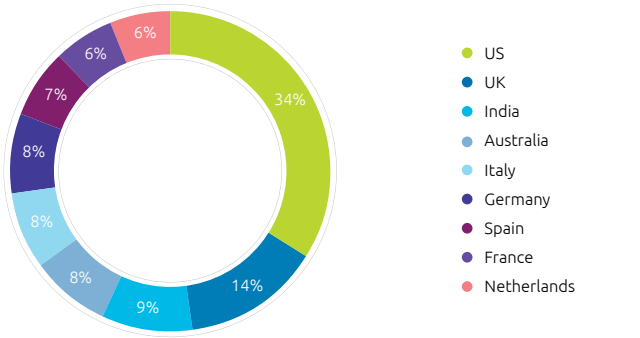
Research Methodology

Our research drew on quantitative and qualitative techniques. Between March and June 2017 we surveyed 993 respondents from companies implementing AI across a range of sectors and countries:

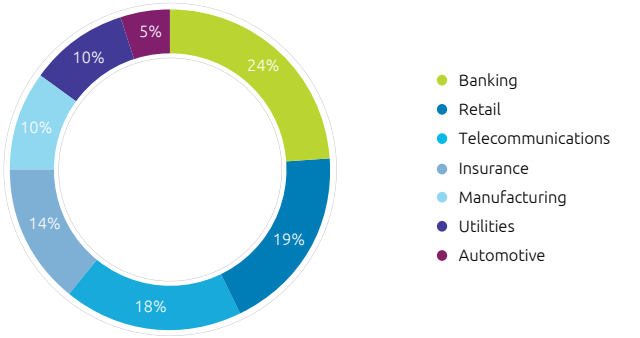
- Automotive, Banking, Insurance, Manufacturing, Retail, Telecommunications, and Utilities
- The United States, United Kingdom, Australia, France, Germany, India, Italy, the Netherlands, and Spain

We also conducted interviews with academics and industry leaders, examining the impact of AI, implementation challenges, and emerging best practices.

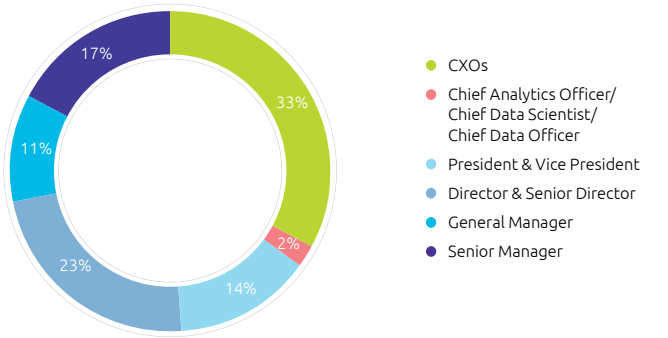
Respondents by geography



Respondents by sector

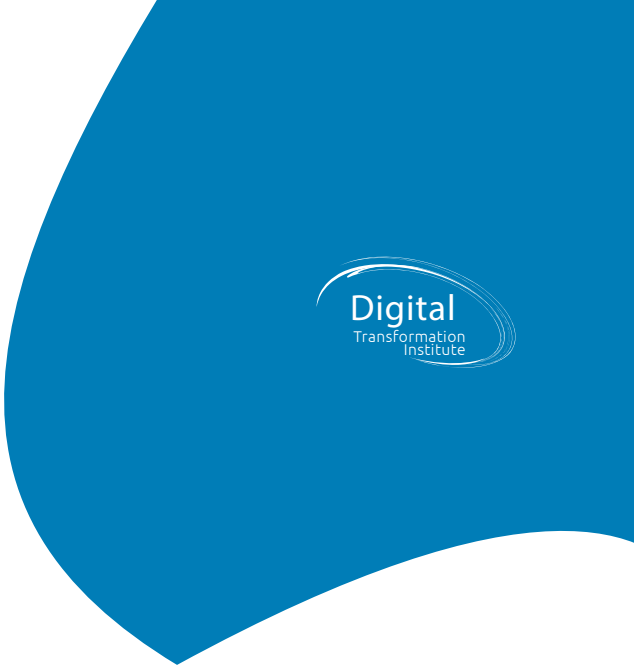


Respondents by role



Conversational Commerce:

Why Consumers Are Embracing Voice Assistants in Their Lives



A report by Capgemini Digital Transformation Institute

To understand consumer interest in Conversational Commerce in detail, and its implications for businesses, we conducted a survey of over 5,000 consumers. We also undertook focus group discussions with consumers in the US, the UK, France, and Germany, examining their Conversational Commerce interactions, their preferences, and their expectations.

Our research findings show that voice assistants are on the cusp of transforming commerce. In this research, we:

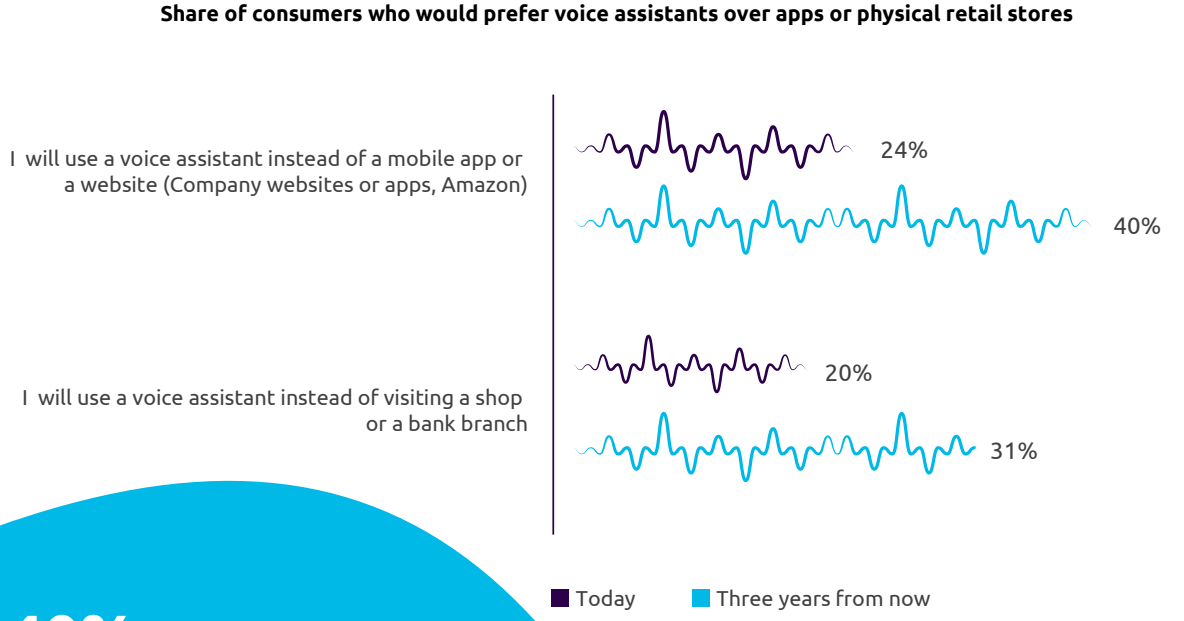
1. Outline why **voice assistants are about to revolutionize commerce**, based on the functions, use frequency and context in which consumers like to use voice assistants
2. Analyze **why consumers love voice assistants**, depending on their needs and preferences
3. Ascertain the **concrete benefits of Conversational Commerce** for retailers, consumer products, and services organizations
4. Recommend an action plan for organizations to **devise a sound Conversational Commerce strategy.**

Voice assistants are about to revolutionize commerce

Voice assistants will become a dominant mode of consumer interaction in three years

Our research found that consumers see a future where they will be increasingly willing to use voice assistants instead of websites or physical shops. Today, around a quarter (24%) say they would use a voice assistant rather than a website. However, three years from now, that rises to 40% (see Figure 1). And close to a third (31%) would prefer to use a voice assistant instead of visiting a shop or a bank branch in the future, compared to 20% today.

Figure 1. Consumers are developing a strong preference for interacting with companies via voice assistants



40%

Consumers who will use a voice assistant instead of a mobile app or a website, three years from now

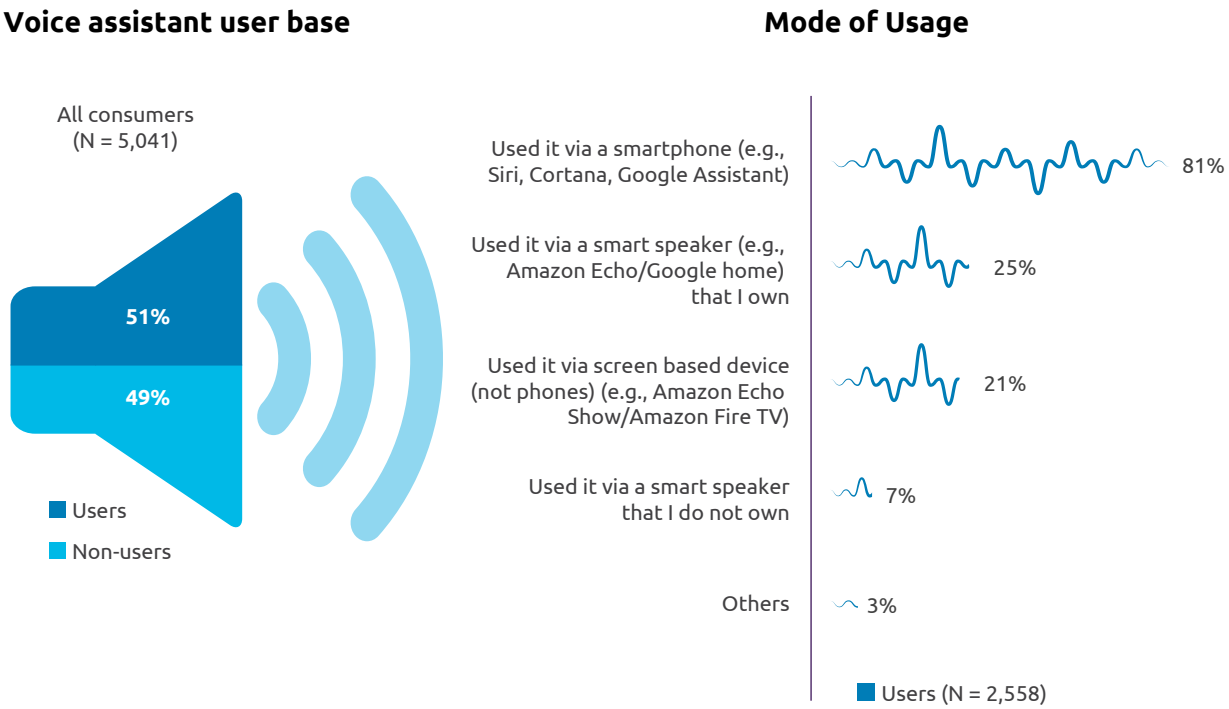
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

81%
Users of voice assistants who have used them via smartphones

Consumers are already using voice assistants for making purchases

As Figure 2 shows, a majority of consumers (51%) are already users of voice assistants, and interacting with voice assistants via smartphones (81%) is the dominant mode of use. Twenty-one percent of consumers have been using voice assistants from devices other than phones or smart speakers. It is evident that voice assistants are likely to be used for commerce through devices other than phones or smart speakers in the future.

Figure 2. Majority of consumers already use voice assistants

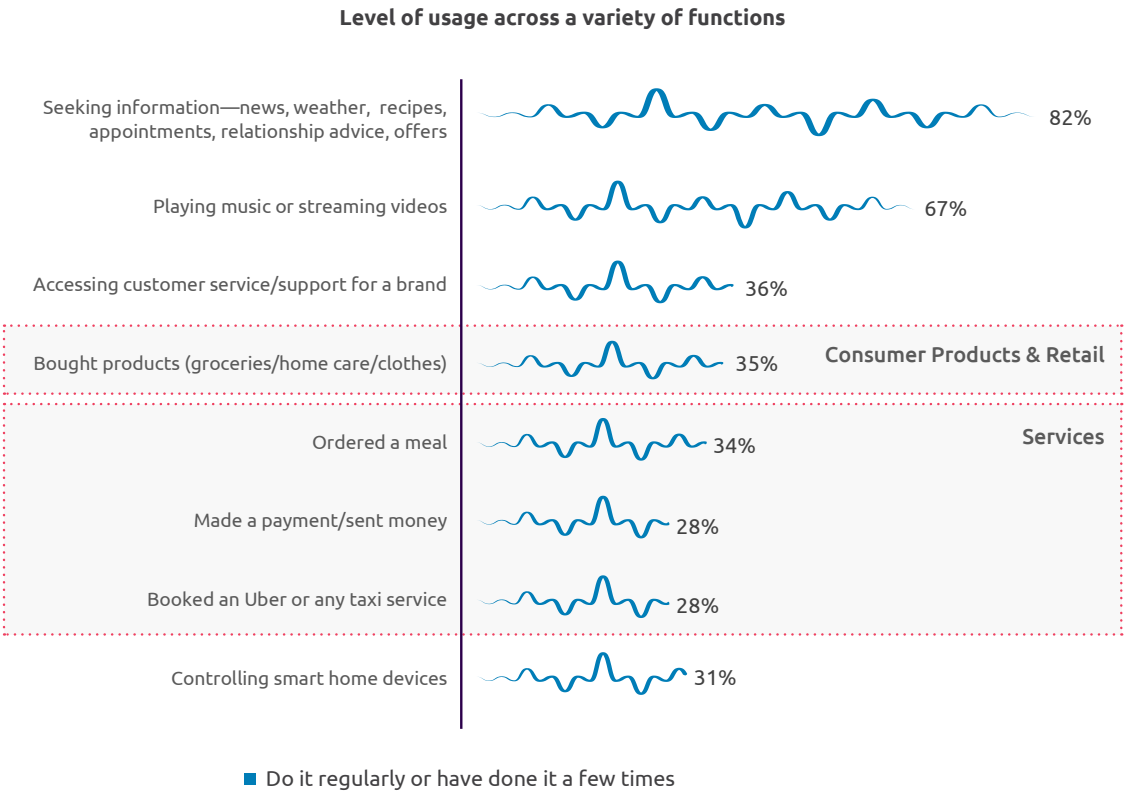


Source: Capgemini Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

We define users of voice assistants as those respondents who have used voice assistants at least once in any form—via smartphones, smart speakers, screen-based, and other devices enabled with voice assistants (not smartphones); everyone else is termed a non-user.

Users have adopted voice assistants for a variety of functions. More than four in five consumers have used voice assistants for seeking information (82%) and two in three have used them for playing music (67%). Usage has also extended to commerce-related activities.[1] Over a third (35%) have bought products like groceries, homecare, and clothes (see Figure 3).

Figure 3. **Users of voice assistants have already been adopting them for making purchases**



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.

35%

Users who have bought products such as groceries and clothes via voice assistants

[1] For the purpose of this paper, we define products as all things that are covered in consumer products and retail; and we define services as ordering a meal, banking-related transactions, and booking a taxi service.

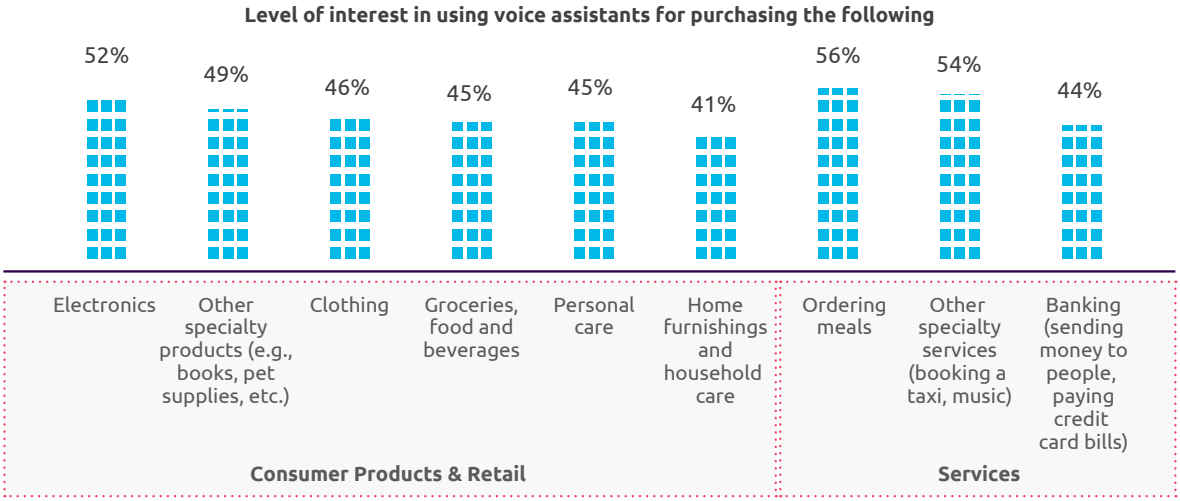
56% Users who are interested in ordering meals from restaurants using voice assistants

Our research shows developments in a number of areas:

Product purchases

Users also shared the product categories they would be most interested in. More than half (52%) would be interested in buying electronics via voice assistants, with significant interest also shown in areas such as clothing, groceries, and home furnishings (see Figure 4).

Figure 4. Users' interest in using voice assistants for purchase is high across most product and service categories



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.

These existing and potential behaviors tie in with some of the advances already made by retailers and brands to launch voice shopping via partnerships with tech platforms like Google Assistant and Amazon's Alexa:

- Walmart partnered with Google to provide highly personalized voice shopping. It recently launched its voice platform to allow consumers to shop more than two million Walmart items through voice.[2]
- The French cosmetics retailer, Sephora, recently launched its app on Google Assistant, Google's voice-activated virtual personal assistant.[3] The assistant allows consumers to book beauty services, with more functions soon to come.
- Ocado became the first British retailer to launch voice ordering capability on Amazon Alexa in August 2017.[4] Using this Alexa Skill, customers can also add products to an existing order and seek information on in-season products and how to use them in recipes.

[2] Walmart, "Walmart Makes Voice Shopping Even More Affordable with New Google Device," October 2017

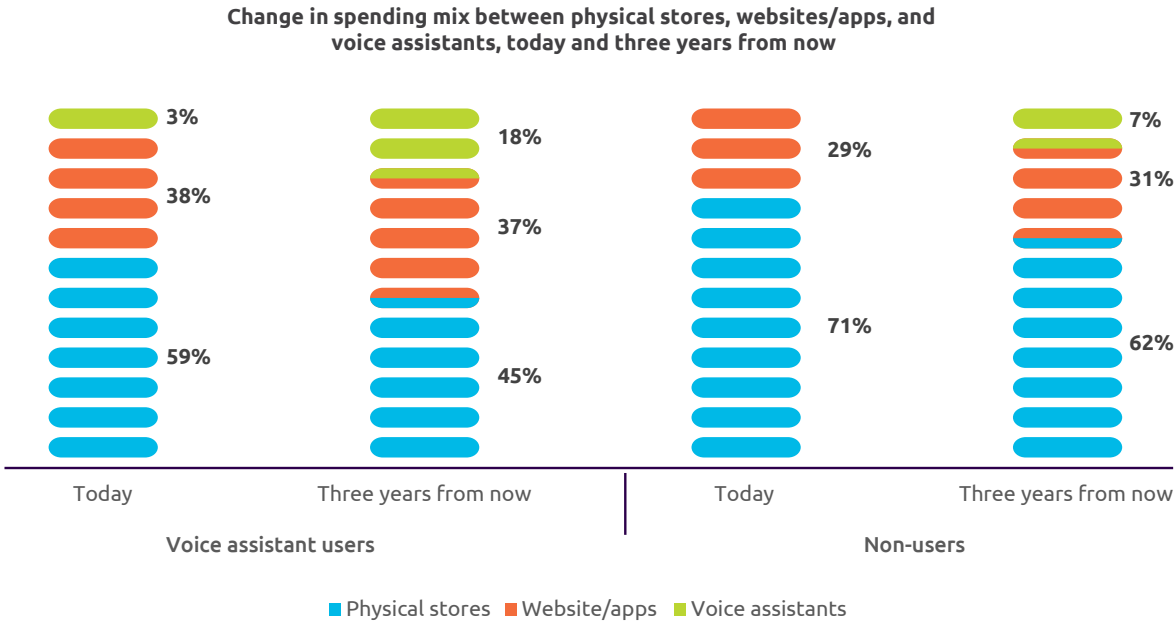
[3] Fashion Network, "Sephora launches voice assistant app," November 2017

[4] Daily Mail, "'Alexa, add milk': Ocado becomes the first UK supermarket to launch an app for Amazon Echo that lets you buy food by calling out your shopping list," August 2017

Consumers will be voting with their wallets in favor of voice assistants over other channels

Our research confirms that consumer interest in using voice assistants for purchase will strengthen. In three years' time, active users of voice assistants expect 18% of their total expenditure to take place via voice assistant, a sixfold increase from today (see Figure 5). Even non-users—those who do not use voice assistants today and hence do not spend anything via voice assistants—expect to devote as much as 7% of their total spending via voice assistants on average.

Figure 5. **Spending via voice assistants is expected to grow as much as sixfold in three years for users of voices assistants**



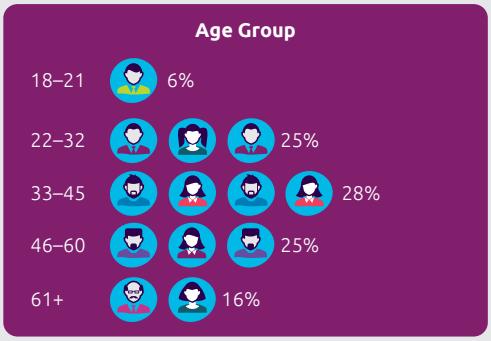
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

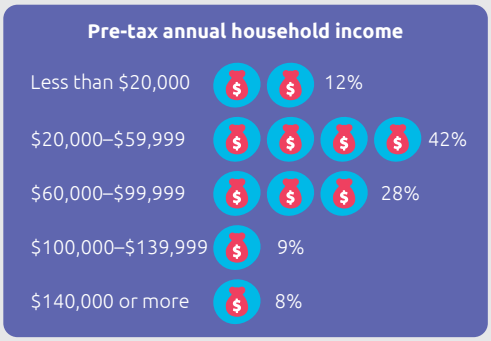
6X

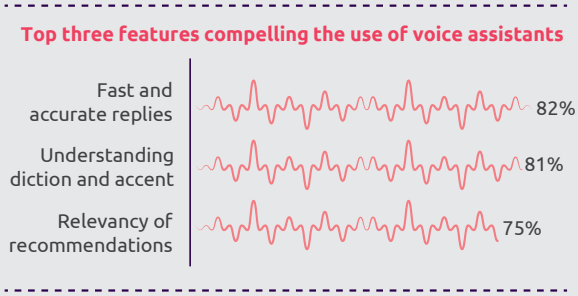
The increase in share of users' spending via voice assistants amongst spending via all channels

Profiling voice assistant users

- 82% users say fast and accurate replies are the most compelling feature that influences the use of voice assistants.
- More than two-thirds (69%) prefer using voice assistants in their living rooms, while only 32% of users are comfortable using voice assistants around unfamiliar people, suggesting there is a shyness among users to engage in dialog in public.
- Safety and security of their personal data is of most value to them in their interactions with voice assistants.
- Close to one in five have an annual pre-tax household income of more than $100K.
- The largest category of users falls in the age bracket of 33–45 years.







Preferred location for interaction
- Living room, 69%
- Kitchen, 61%

Preferred social setting
- With close friends or family, 50%
- "When I am alone," 46%

Top three criteria that add value
- Safety and security of data (71%)
- Saving money through deals, promotions (68%)
- Saving time in the overall purchase process (64%)

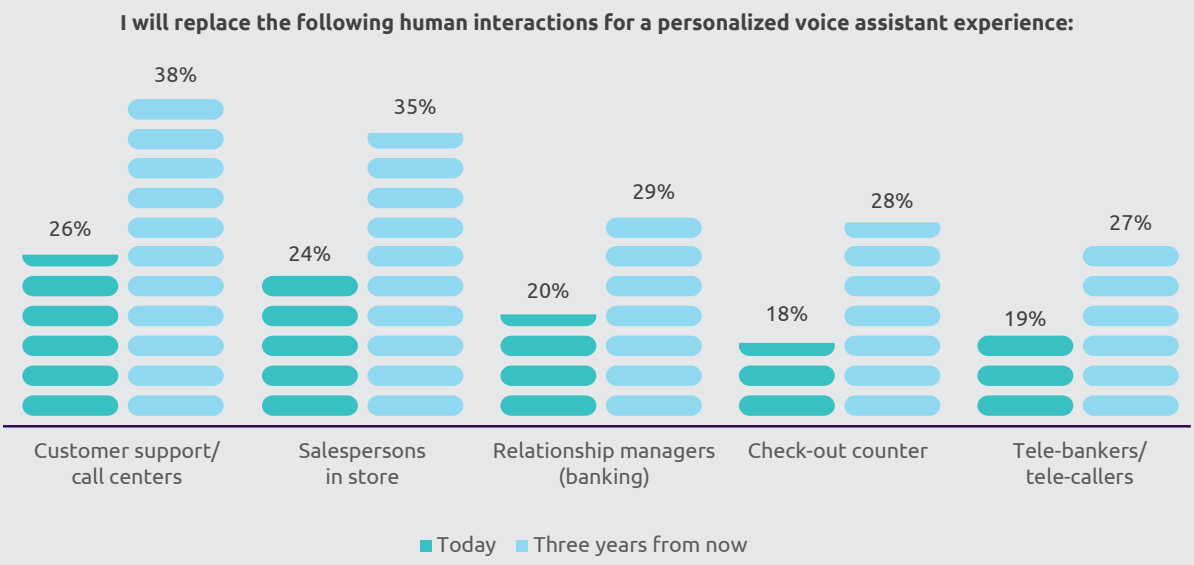
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.

Conversational Commerce can be used to enhance the relationship between the retailer and consumer in the store

As our voice assistant user profile displays, there is a great opportunity to engage in a dialog when the consumer feels comfortable and feels at "home." Conversational Commerce can extend the relationship between the retailer and the consumer beyond the store since the majority of users prefer their home for interacting with voice assistants, but it can also be used to enhance the relationship in the store.

In the future, over a third of consumers would be willing to replace customer support or shop sales support with a personalized voice assistant (see Figure 6) in order to enhance their in-store experience. Consumers' common complaint with today's interactions is that they are slow and inconvenient. As a US consumer in one of our focus group discussions told us: "I think if I had a choice, I would use a voice assistant. It would be faster and less stressful. I have had some really hard times sometimes with customer support. I think the voice assistants could take away a lot of stress and headache." The idea of interacting with voice assistants instead of salespeople also resonated with some consumers in the UK, with one telling us: "If I need to locate something in the shop, I would rather have a voice assistant help me find it than find a salesperson."

Figure 6. Share of respondents who would replace human interactions with a personalized voice assistant today, and three years from now



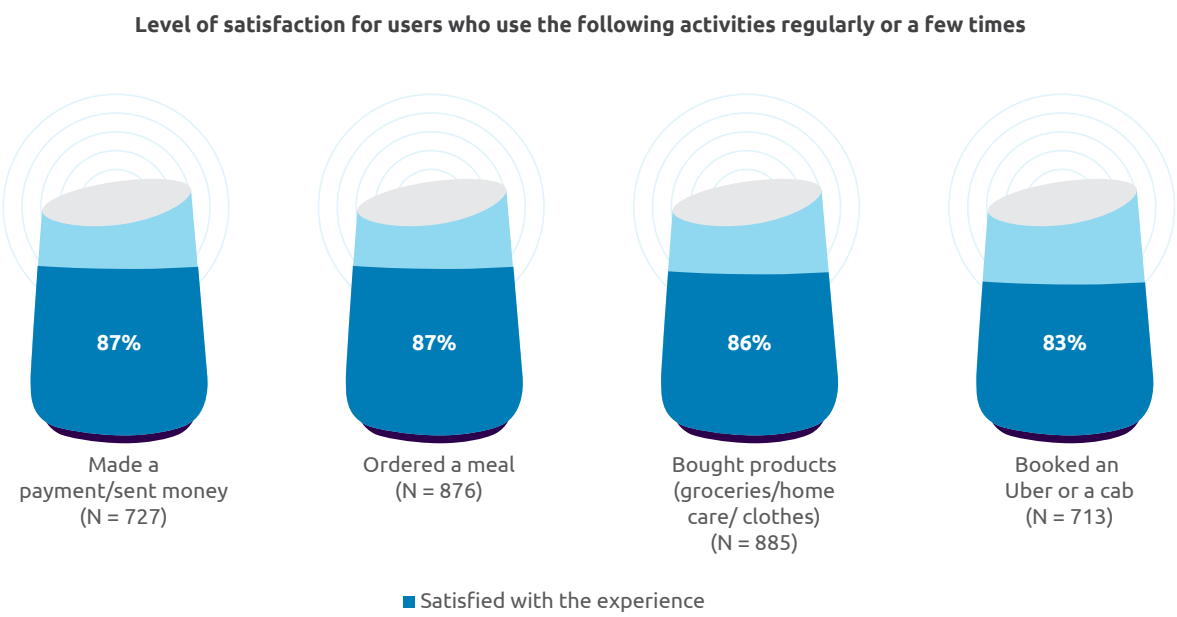
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany, ranked by difference between three years from now and today.

Why consumers love voice assistants

Users are satisfied with their voice interactions

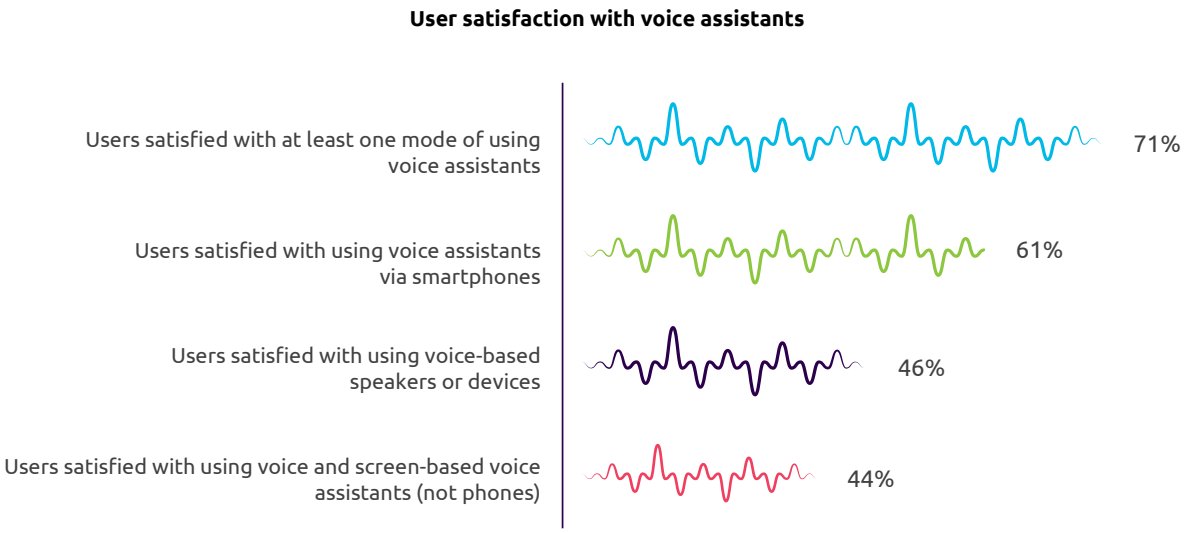
Consumers who use voice assistants are very positive about the customer experience. As Figure 7 shows, they are positive about activities, from making payments to buying groceries. Overall, 71% of users are satisfied, and when we segment that satisfaction score by device, smartphones score highest.

Figure 7. **More than four in five users are satisfied with their voice assistant experience for purchase-related activities**



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.

Smartphones lead in user satisfaction for use of voice assistants



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.

Consumers like the convenience, speed, and the ability to multi-task

Convenience (52%) and ability to do things hands free (48%) are the two biggest reasons for preferring voice assistants over mobile apps/websites (see Figure 8). As we heard during the focus groups:

- "The biggest thing for me about voice assistants is to be able to do what I want to do hands off, like if I am cooking. In such situations I don't want to touch the phone or the tablet and would just like to use the voice assistant for convenience."

  —US focus group participant

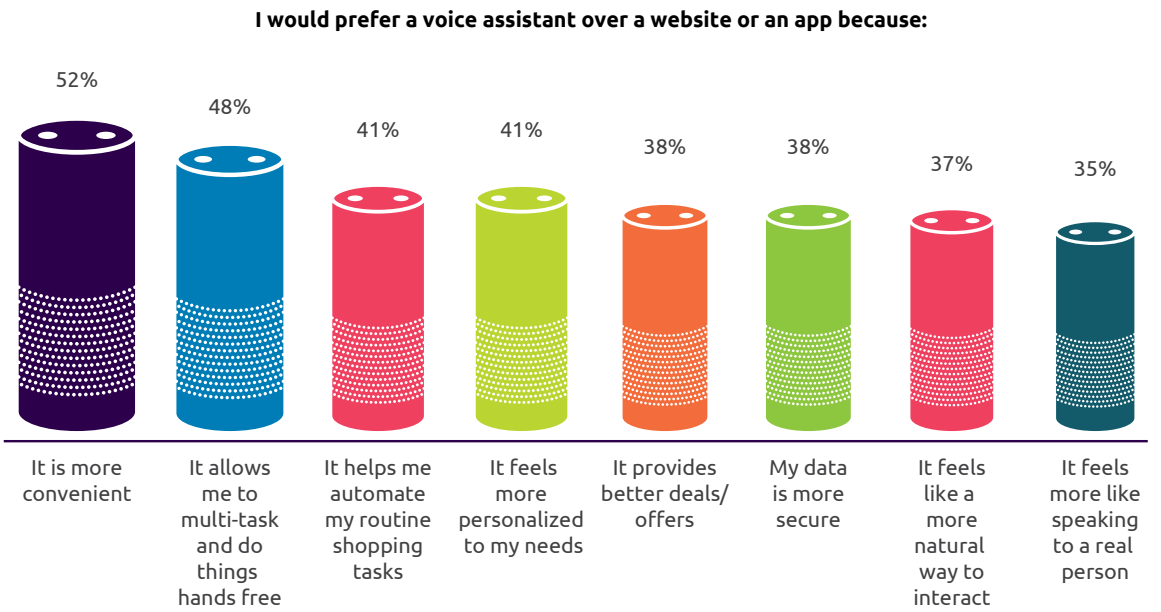
- "With two kids and a life that's going so fast, I think it would save a lot of time to automate daily chores. For example, during driving, checking maps, or finding a parking space would be much more practical."

  —French focus group participant

41%

Consumers who would prefer a voice assistant over a website or an app because it helps them automate their routine shopping tasks

Figure 8. Convenience and ability to multi-task top the list of reasons for preferring voice assistants over websites and apps



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

The fact that voice assistants are faster (49%) and more convenient (47%) are the major reasons for preferring them over physical stores (see Figure 9). This was confirmed in the focus groups:

- "I would rather interact with the voice assistant, especially while making purchase orders. It would just make it more accurate, because with humans, they could write it down wrong or get the quantity incorrect or other factors."

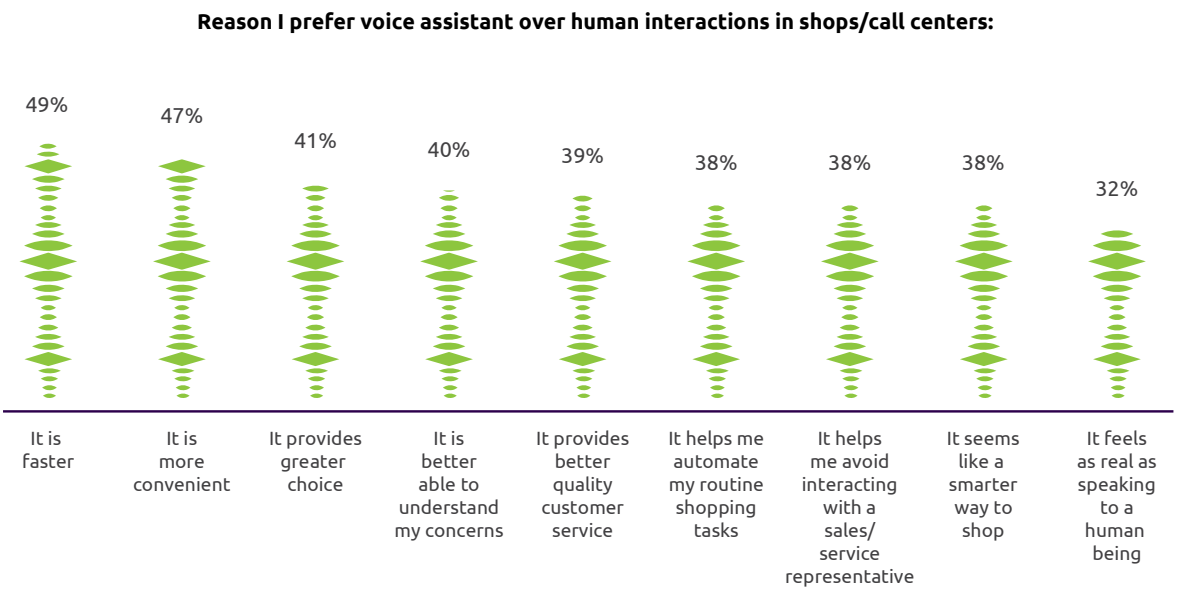
  —US focus group participant

- A UK consumer outlining the convenience advantages for repeat purchases said: "When I am ordering my usual coffee at Starbucks, I would rather go with a voice assistant. It saves time and effort on my part. But if I am going to the bank, I would like a person to help me, because there could be greater complexity."

49%

Consumers who would prefer voice assistants over human interactions in shops/call centers because it is faster

Figure 9. Speed and convenience top the list of reasons for preferring voice assistants over human interactions



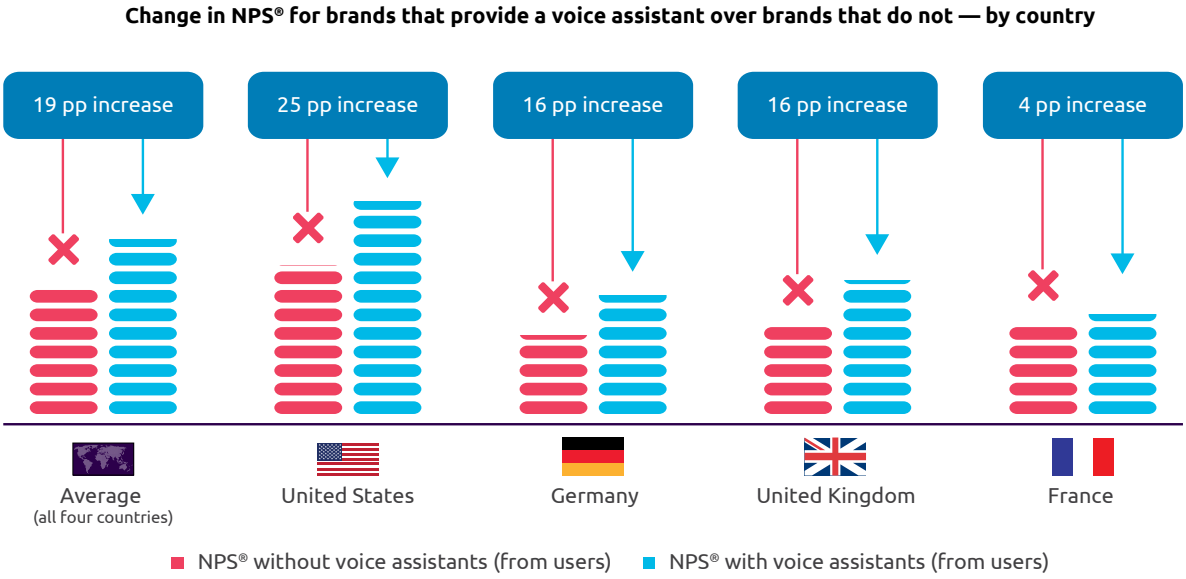
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

Conversational Commerce yields concrete benefits for retailers and brands

Providing voice assistants can significantly improve brands' Net Promoter Scores (NPS®)#. Among users, the NPS® of a brand would improve by nineteen percentage points when it provides a personal voice assistant globally (see Figure 10). This improvement is particularly pronounced in the US, where the NPS® would improve by twenty-five percentage points for a brand which offers a voice assistant. This is a real opportunity for brands to drive customer satisfaction among voice assistant users.

25 percentage points
NPS® advantage among voice assistant users for a brand in US that provides a voice assistant to consumers vis-a-vis a brand that doesn't

Figure 10. Providing a voice assistant to consumers elevates a brand's NPS® by nearly 20 points for voice assistant users



pp = percentage points

We asked the respondents the standard NPS® question on how likely are they to recommend a company to a friend or colleague, in two scenarios: 1. The company provides a personal voice assistant, and 2. The company doesn't provide a personal voice assistant.

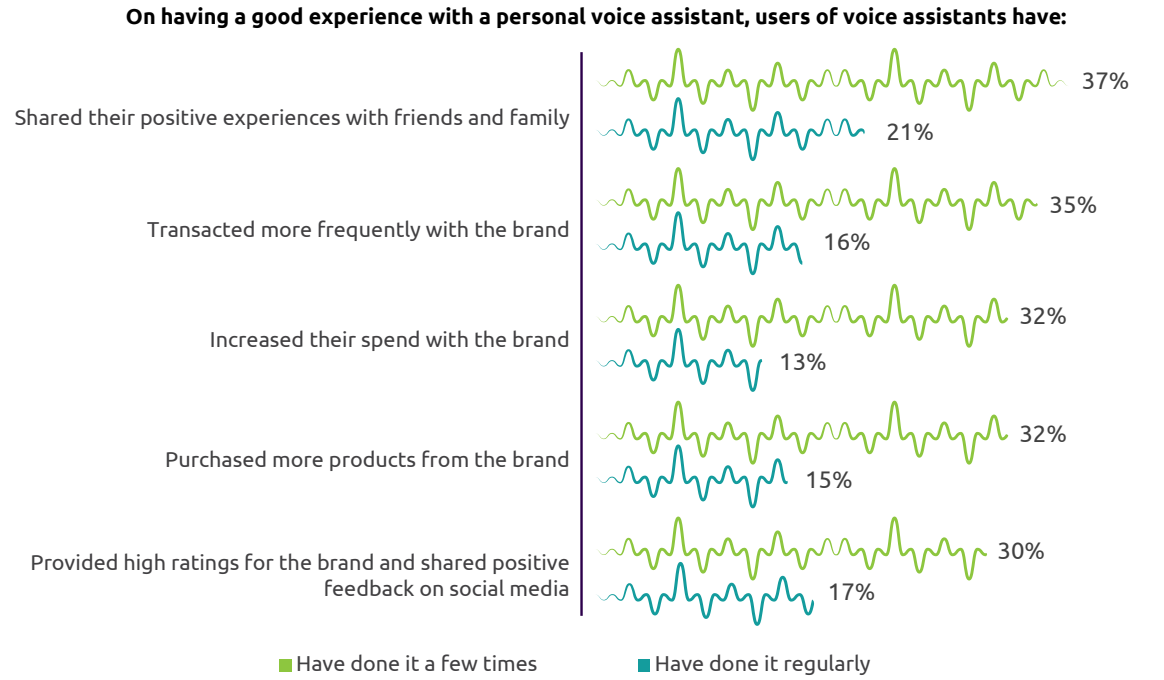
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France and Germany.

#Net Promoter, NPS®, and the NPS®-related emoticons are registered service marks, and Net Promoter Score and Net Promoter System are service marks, of Bain & Company, Inc., Satmetrix Systems, Inc. and Fred Reichheld

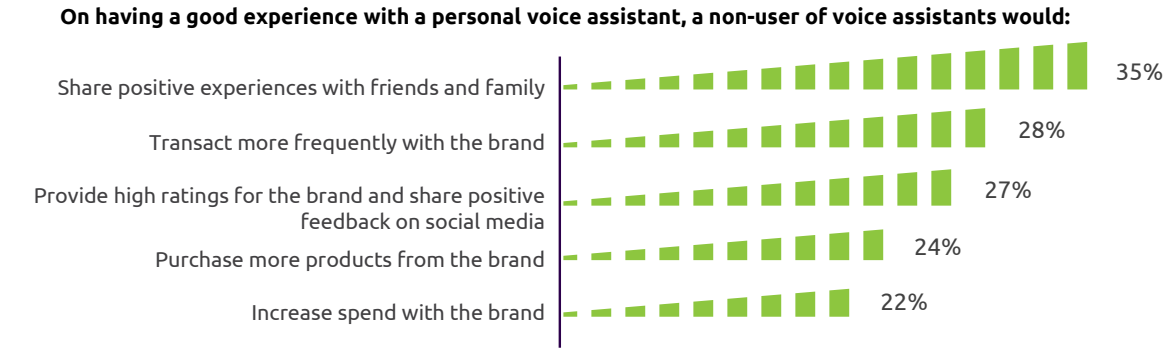
Organizations providing good voice assistant experiences will generate more business and positive word-of-mouth

Users of voice assistants give organizations with a strong voice assistant experience more business and positive word-of-mouth. Non-users are expected to do the same (see Figure 11).

Figure 11. **Users of voice assistants have rewarded organizations providing good voice assistant experience; non-users will follow suit**



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,558 users in the US, UK, France, and Germany.



Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 2,483 non-users in the US, UK, France, and Germany.

16%

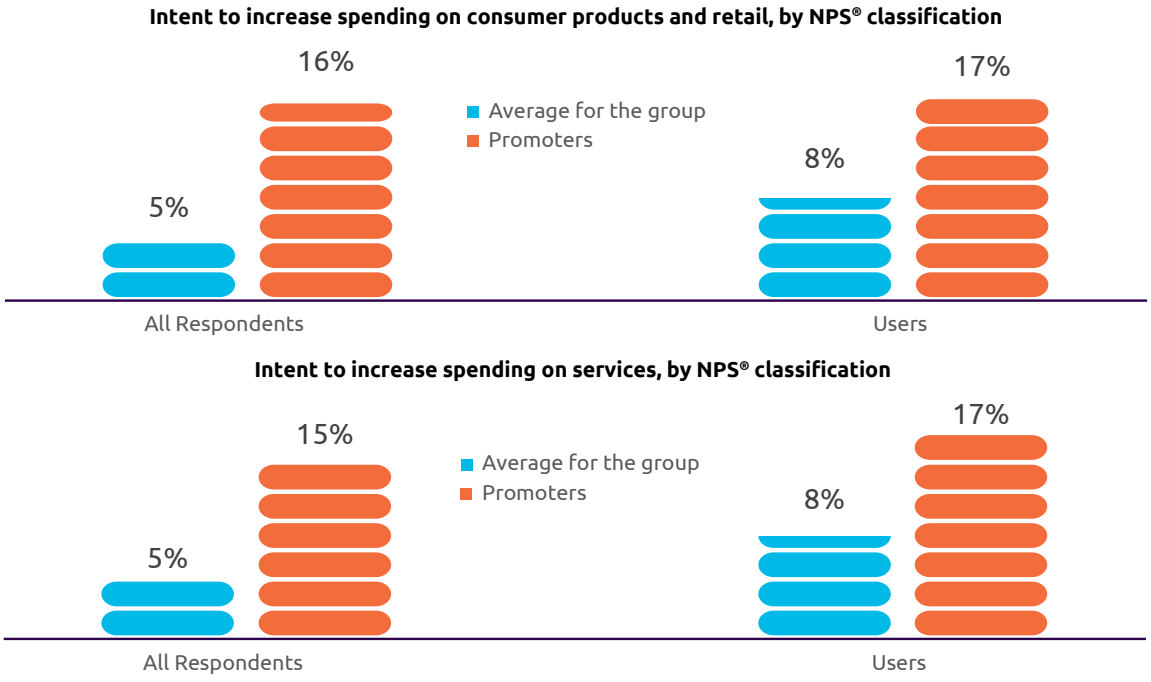
Amount of increase in spending on consumer products and retail by NPS® promoters of a brand upon receiving a better experience with voice assistants

Retailers and brands that provide a good voice assistant experience will secure bigger consumer spend

In return for receiving a good voice assistant experience, consumers are willing to increase their spending with a brand by 5% on average. When we look at two segments—consumer products and retail, and services—we find that:

- On average, those users who are using voice assistants today will increase their spending by 8% for both segments.
- Those overall consumers who are classed as "promoters" for NPS® purposes have a significantly higher propensity to increase their spend—16% for consumer products and retail, and 15% for services.

Figure 12. **Users of voice assistants will reward organizations with increased spending for receiving a better experience with voice assistants**



Percentages indicate the amount that respondents are willing to increase, on average, upon receiving a good experience with a personal voice assistant.

Question to users: Have you done the following on having a good experience with a voice assistant? Increased your spend with the brand. Question to non-users: What are you most likely to do if you have a good experience with a personal voice assistant? To both users and non-users, answering the above question positively, the follow up question asked was: How much more will you be willing to spend for receiving a better experience with voice assistants?

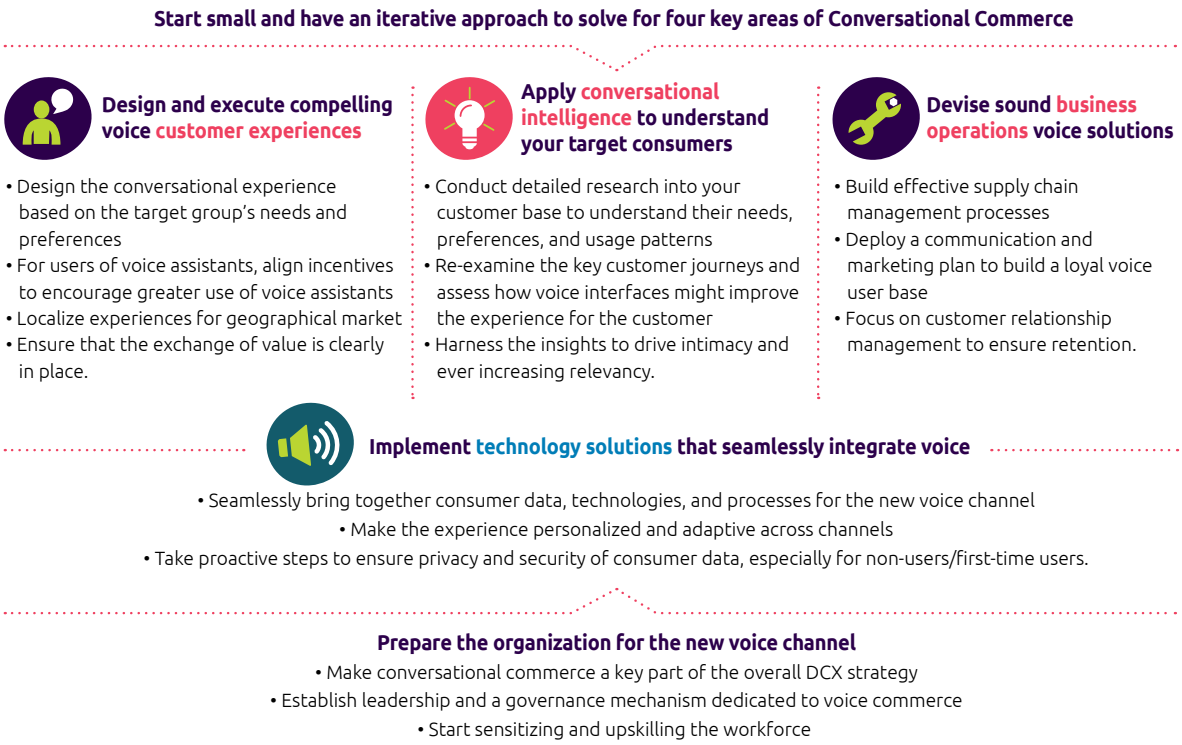
Source: Capgemini Digital Transformation Institute, Conversational Commerce Survey, October–November 2017, N = 5,041 consumers in the US, UK, France, and Germany.

How can retailers and brands devise a sound Conversational Commerce strategy?

Organizations need to focus on four key areas for Conversational Commerce

From our experience working with global clients on devising and implementing Digital Customer Experience (DCX) strategy and our recent development of a Conversational Commerce framework, we believe that delivering a successful Conversational Commerce strategy requires effort in four key areas (see Figure 13). While organizations start to build and integrate these solutions, it is key that they start small and take an iterative, test and learn approach to implement a successful voice commerce strategy.

Figure 13. Four key areas of focus for building a robust Conversational Commerce strategy

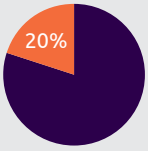


Source: Capgemini Digital Transformation Institute Analysis.

Research Methodology

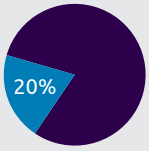
For this research, we surveyed over 5,000 consumers in the US, the UK, France, and Germany. The quantitative research was complemented with four virtual focus group discussions, with eight to ten consumers per focus group, for each of the surveyed countries. The survey, as well as the focus group discussions, had a healthy mix of demographics and user and non-user respondents.

Country



France

N = 1,007

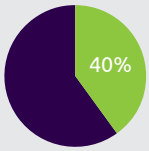


Germany

N = 1,010

United Kingdom

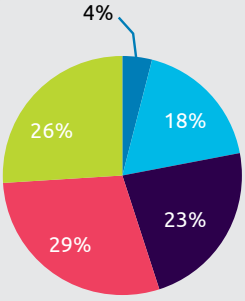
N = 1,003



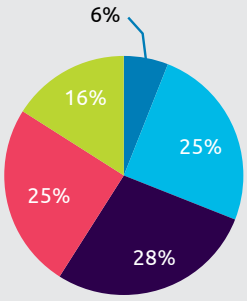
United States

N = 2,021

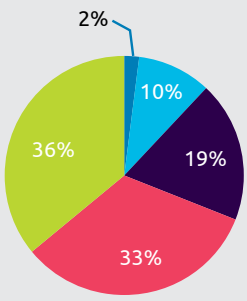
Age



All consumers
N = 5,041



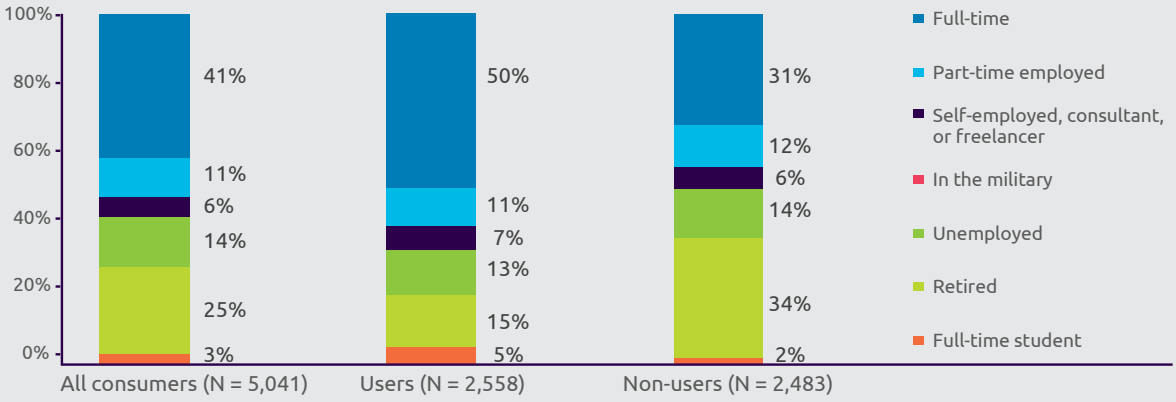
Users
N = 2,558



Non-users
N = 2,483

18–21 22–32 33–45 46–60 61+

Employment Status



Capgemini

Digital Transformation Review

Guest Contributors

Michael Natusch

PRUDENTIAL

Atif Rafiq

VOLVO

Professor Luciano Floridi

UNIVERSITY OF OXFORD

Michael Schrage

MIT

Frank Chen

ANDREESSEN HOROWITZ

Rajen Sheth

Google

Babak Hodjat

sentient

Rob High

IBM Watson

Lili Cheng

Microsoft

Amr Awadallah

cloudera

Digital Transformation Institute

By Capgemini Digital Transformation Institute