

AI First: Learning from the machine

Machine Intelligence

Report 4 of 4



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Why this report?

Recent studies on the impact of Artificial Intelligence (AI) are quite clear: organizations that are proactively deploying AI present better profit figures than the average in their market. This applies to all the sectors in which they operate. Actively working with AI, organizations will eventually achieve a profit growth of almost 40 percent in less than 20 years, if we can believe the surveys. Not surprisingly, in that same period, AI will become the most important factor for economic growth (increase in GDP). More and more companies are now taking action. More than a third of the organizations apply AI at scale.

Driven by important breakthroughs in this area, major players in the tech industry such as Google, Microsoft and Salesforce argue for an 'AI first' agenda. Microsoft has included AI in its new mission statement and has already taken out 'mobile first'.

We know the recent history of the 'digital first' era followed by the 'mobile first' era. How should we interpret the arrival of the 'AI first' era in the continuing evolution of the Internet? There are opportunities for 'AI first' in many areas. As with the two preceding periods, the question is once again how AI transforms your market and whether you are able to seize the resulting opportunities.

Key takeaways

AI first

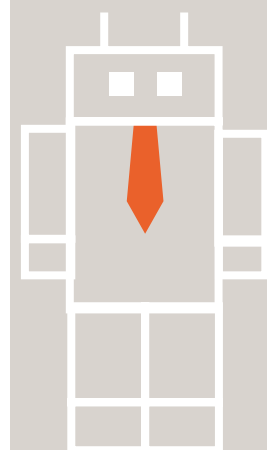
Place AI at the heart of your digital activities, that is the most important message. After decades of too much promise from technology, we now see a breakthrough in the realization of concrete business value. A new AI focus is essential because your competitor will certainly use the learning acceleration offered by AI's specific capabilities to gain a head start.

Learn & Discover

Artificial intelligence gives machines the ability to perceive, interpret, learn and discover and even speak to us in common human language. This is the new material that organizations have to incorporate in their daily business. We call it 'The New Fabric of the Internet'; we explore its possibilities through practical cases, ranging from AI systems that conduct independent research to robots that make commercials and banks that see the chatbot economy as their strategic future.

Corporate IQ

The possibilities offered by this 'new material' lead to a so-called 'smartening of acceleration'. The answer to this is to learn quickly and preferably in a scalable manner. To increase intelligence – the Corporate IQ – we present six actions, ranging from a bimodal AI approach for both incremental and disruptive AI applications, to stimulating an open-mind/mindfulness culture that focuses on 'building new knowledge'.



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INTRODUCTION

Two years ago, when we started with a series of reports on this subject, nobody used the word artificial intelligence easily. It was a sensitive term for a technology that had promised far too much for far too long. Meanwhile, this idea has changed. Halfway through 2017 a number of reports were published in rapid succession, describing AI as the driving force behind economic growth and profit. Accenture, PwC and McKinsey scattered the superlatives. Accenture predicts a 39 percent profit growth for organizations with a growth path to 2035. PwC predicts a growth of 14 percent of GDP in 2030: all thanks to AI. McKinsey shows profit figures of companies that apply AI at scale; they score higher in each sector. Our own Digital Transformation Institute recently published a study showing that more and more companies are applying AI at scale. The firmness with which growth rates are presented is in stark contrast to everything we have experienced in the recent AI history: from dreams, experimentation and failure to success with hard currency.

It strengthens our idea to speak of 'AI first': AI in the heart of the digital strategy of organizations. Not from the perspective of a new technology hype, but because it is a logical sequel to decades of consistent IT developments: first digital, then mobile and now intelligent; first building a transaction medium, then the smartphone and the empowerment of the individual, and now the smartening of this transaction network and the devices. The only conclusion to be drawn is that we are entering a new phase in which AI helps us make great discoveries. The ability to share thoughts (Deep Learning), to view (computer vision) and to participate (natural language generation) make up the new building blocks of this journey of discovery. Those building blocks together make AI what it is: seeing machines do things that are so intelligent that you would suspect they are done by a human being. This is also the freely translated definition of John McCarthy of artificial intelligence at the Dartmouth Conference

in 1956, where these words were first mentioned. The intelligence of the artificial is determined by the building blocks, but also by our views on what intelligence actually is.

Machines that are going to discover are new, and so is an Internet that learns. What we are going to do with these discoveries largely determines the future of transport, education, industry, care, finance ... No sector or profession is immune to the learning acceleration of AI. Anyone who is caught by the idea of 'AI first' as a new IT strategy, will soon run into a plethora of possibilities and business cases. The solid foundation on which these cases are based is described in Herbert Simon's classic *The Science of the Artificial* (1969) and Daniel Kahneman's *Thinking Fast and Slow* (2011). Human intelligence, because that is what it is about, is limited and has many gaps. Our short-term memory can handle around five to nine different pieces of information simultaneously, and we have

developed many unconscious strategies that are fast and efficient, but will also often send us to the wall due to the lack of nuance. Smart algorithms may help provide a solution.

From judging a traffic situation to recruiting the right person, offering the right product to a customer or making a television commercial that excites the consumer, we can learn in all these areas. The new, intelligent age of the Internet is therefore dominated by Learn & Discover, in which machines not only learn from people, but people also learn from machines. The main challenge for organizations is to be open to these opportunities. We hope that the many cases in this report will inspire you to do so; 'being open to' needs to be a serious item on the agenda. Mindfulness is an important response to tackling conventional wisdom and to break through the routines of thought and action. Machines are mindless and focus on the task; human beings cannot compete with that. But only man can use AI as a source for new discoveries, as a new perspective on business and science. Adequate cooperation between man and machine will significantly increase the overall level of intelligence of the organization: Corporate IQ.

In this report

In this report, we explore the latest developments. We will start with one of the pioneers in this field: Google DeepMind. Google's CEO therefore ushers in the 'AI first' era in the next section. We go through the recent history of the Internet chronologically, from 'digital first' and 'mobile first' to 'AI first'. The retail examples of the digital giants Amazon, Alibaba and WeChat that follow give a nice idea of the direction in which the technology is evolving. It makes it immediately clear that the disruption from the two earlier phases is continued. The figures from the aforementioned studies confirm the picture that AI should be given top priority. The status of the AI technology according to Forrester gives us a number of technological tools. The cases that we then present form the prelude to the synthesis: creating accelerated learning. Finally, the six points we present to increase Corporate IQ, focus on both cognitive and social aspects.

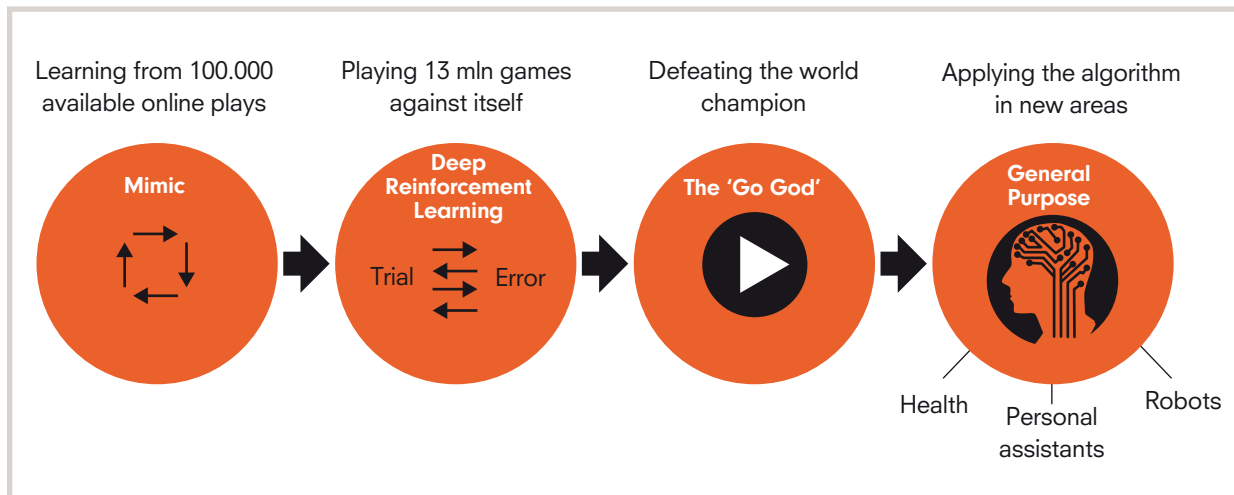
AI FIRST: LEARNING FROM THE COMPUTER

In 2013, Google's parent company, Alphabet, purchased the British company DeepMind for more than 600 million dollars. This is a start-up specialized in artificial intelligence. The neural network of DeepMind can play video games like Pong, Breakout and Space Invaders just like people do. It is also able to imitate the short-term memory of the human brain.

Immediately after the purchase, Alphabet rolled out the technology in its many data centers. The aim was to use these self-learning computer systems to significantly reduce the enormous energy bill. By monitoring some 120 variables in real time, DeepMind experiments with various settings until optimal configuration in terms of energy consumption is achieved. Ultimately, energy consumption was reduced by 15 percent. Knowing that in 2014 Google consumed 4,4,402,836 MWh,

equal to the energy consumption of 350,000 US households, this leads to huge cost savings and will automatically pay back the acquisition of DeepMind.

Perhaps DeepMind is better known through its computer program AlphaGo, which in May 2017 defeated the 19-year-old Chinese Ke Jie, the world's best Go player, 3-0. Earlier on, AlphaGo had defeated several top global players in the 3000-year-old board game, but with



The learning path of AlphaGo. By studying one hundred thousand old game strategies and playing millions of games against itself, AlphaGo was able to defeat the human world champion. It is now explored how this artificial intelligence can be used in other areas.

defeating Jie, this bastion of human intelligence is also defeated. The interesting thing about this game is that sheer computing power is not enough. The computer needs to rely on intuition just like people do. After his loss, Ke Jie shared a message via the Chinese social media platform Weibo, saying that the computer teaches us that human beings, despite developing and fine tuning their tactics for thousands of years, can be completely wrong. In the interview he said:

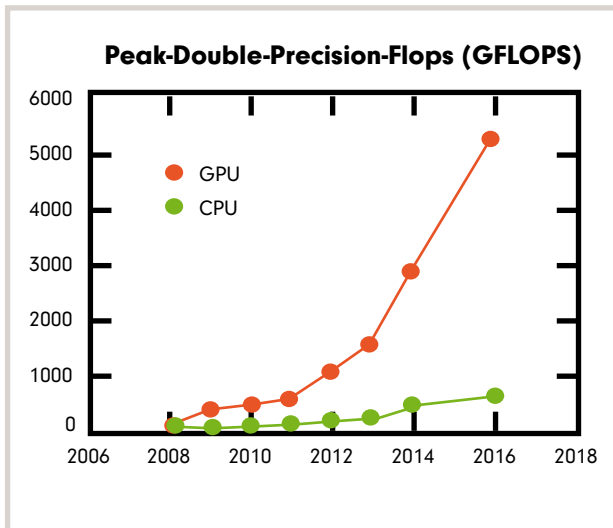
During the games, AlphaGo used completely new and unprecedented tactics. Its opponents typified the game as the 'Go of a distant future'; these tactics could only be developed by letting AlphaGo play against itself. Fifty of these game reports are now shared with the Go community so that they can learn from the AI's reasoning. This illustrates that the real value of artificial intelligence goes much further than the simple idea of man versus machine. Thanks to AI, people learn completely new ways of thinking and therefore develop a higher level of intelligence.

Immediately after the win, the team behind AlphaGo announced that the computer program will stop at its peak and will be taken out of the Go competition. The next move is to use the brain capacity of this neural network for other, higher goals, such as finding new medicines, drastically reducing energy consumption or developing revolutionary new materials.

**'Compared to last year,
AlphaGo is a completely
different player.
In the beginning it was quite
human. Now it is like a God.'**

It is not surprising that Sundar Pichai, CEO of Google, repeatedly praises the potential of AI:

'We are at a tipping point where AI is really taking off... [...] I think we will evolve in computing from a mobile first to an AI first world.'



The processing power enabling an 'AI first' approach has increased significantly over the last decade thanks to the development of specialized mathematical/graphic co-processors or GPUs. Processing speeds of GPUs and CPUs are measured in FLOPS (floating point operations per second). In the mean time, more and more AI-dedicated processing units – also known as AI accelerators – are being developed.

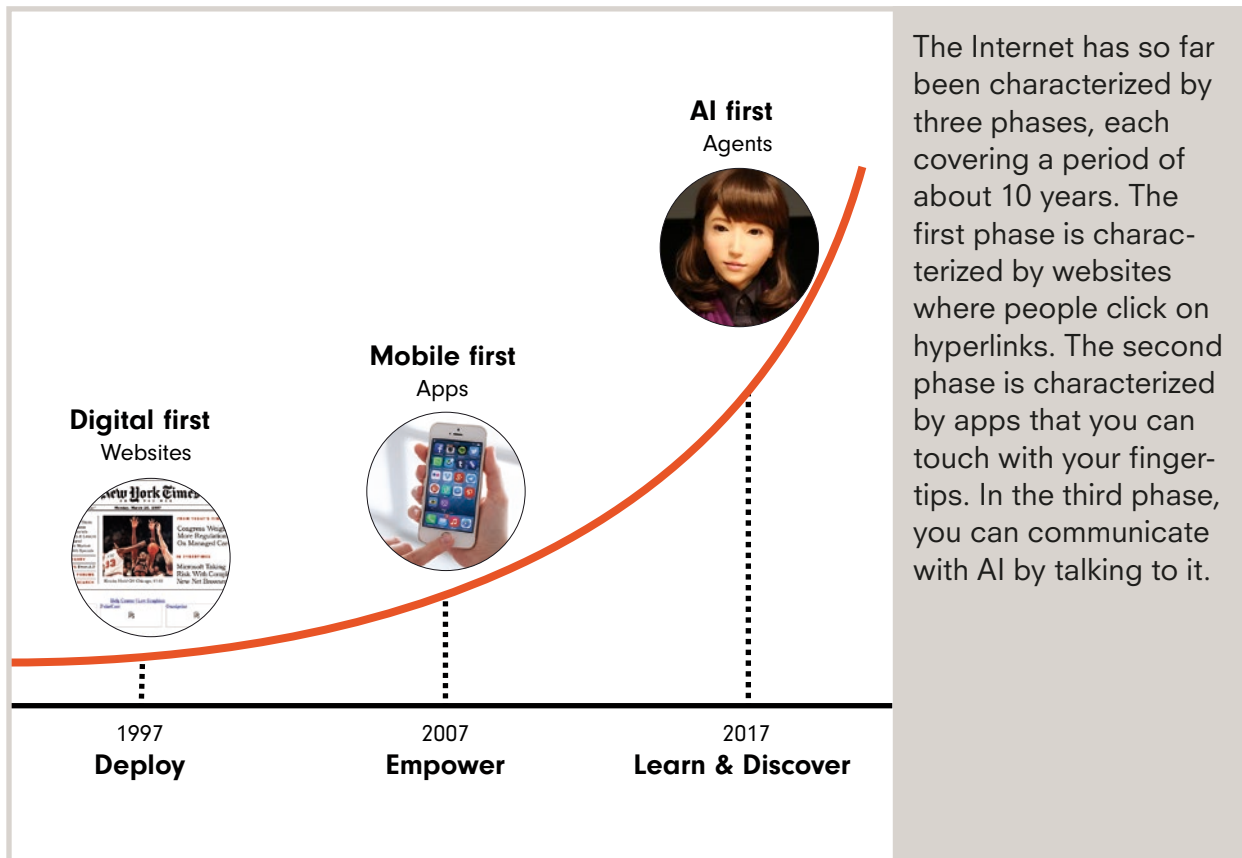
In an explanation of the quarterly figures of the world's largest search engine, he says that the past ten years have been about 'mobile first'. In his view, the next ten years will be about 'AI first'. He anticipates that in the near future the concept of the device will fade completely. Over time, the computer will become an intelligent assistant regardless of its form, providing you with appropriate support on a human level throughout the day. To make this transition possible, Pichai wants Google to turn into an 'AI first' company, obviously with the ambition to become your personal assistant.

At the end of March 2016, Satya Nadella, CEO of Microsoft, announced that intelligent bots are also Microsoft's top priority in its new strategy. In August 2017, Microsoft adapted its mission statement accordingly. In short, the words 'mobile first' and 'cloud first' have changed to 'AI first'. Now Microsoft says it is going for an 'intelligent cloud and an intelligent edge infused with artificial intelligence'. The

company puts 5000 AI researchers into a development unit to focus on AI. Mark Zuckerberg of Facebook came up with a similar message at the end of 2016: in the roadmap that he presented at his developer conference, AI is a prominent centerpiece, with language, reasoning, planning and vision as important competencies in which computers must excel. Marc Benioff, CEO of Salesforce and tech pioneer, even speaks of an 'AI first world', a world which, according to Benioff, goes beyond our imagination. He anticipates that AI will be part of all Salesforce apps in the future, for example by answering our question 'What will I be working on now?' on a daily basis.

For example, Salesforce's own AI program Einstein Guidance is currently joining Benioff every Monday morning for a weekly management meeting. Who knows, Einstein might soon decide for Salesforce what the company should be working on.

The enthusiasm of the technology players is obvious. Of course they hope their enthusiasm will be infectious and that you will buy their AI technology. However, some skepticism is in place here because we know who we are dealing with. But we do like the 'eat your own dogfood' approach and the willingness of all parties to invest.



The Internet has so far been characterized by three phases, each covering a period of about 10 years. The first phase is characterized by websites where people click on hyperlinks. The second phase is characterized by apps that you can touch with your fingertips. In the third phase, you can communicate with AI by talking to it.

We will no doubt hear 'AI first' announcements more often. After 'digital first' and 'mobile first', the 'AI first' decade has begun. Anyone who has followed the developments in the field of graphic co-processors understands that this meets one of the crucial preconditions. This new hardware generation enables high-speed mathematical calculations that require pattern recognition behind speech, text and image recognition. This allows the software to listen, reason, anticipate and speak. This is not only happening in the cloud, but also on the smart-

phone – 'intelligence at the edges', as Nadella calls it so beautifully.

This 'AI first' era should not be seen in isolation from the earlier developments in technology. We have just left the age of 'mobile first' behind us, and shortly before that we experienced the hype on doing digital business in general. We called it the New Economy back then, a 'digital first' economy, which came about in fits and starts. The euphoria about a new economy and the launch of a new 'phone' is now followed by euphoria about artificial intelligence.

We label these three phases of the Internet as follows:

Deploy Digital first (1997-2007) Digital overconfidence and steady transformation towards a network society

Building a network society is the focus. In this period the global Internet adoption began to take shape. 'Digital first' started in 1997 with the term New Economy and later the superlative of the New New Economy. First of all, investments had to be made in digital technology; the clicks would be worth much more than the bricks. In *Wired*, Peter Schwartz and Peter Leyden published their famous article 'The Long Boom', in which they predicted 25 years of prosperity thanks to 'digital'. But there was plenty of skepticism; numerous studies showed that people would never buy things on the Internet and would certainly not share credit card details, because how could you trust the other person? Despite skepticism, the number of transactions in trade and business – e-commerce and e-business – grew rapidly. Nasdaq took a considerable advance on the digital success but lost 78 percent of its market value after March 2000. For a moment the old economy was back in first place again. The second phase of this era was dominated by the emergence of social media (Facebook, Twitter, LinkedIn). Social media laid the foundation for today's network society in which there is no longer any doubt that a 'digital first' strategy might be wise.

Empower Mobile first (2007-2017) Platform innovation in a Big Bang-adoption era

Empowering the world's population is the focus. Apple's first smartphone came on the American market in 2007 and on the European market one year later. In no time everyone was hooked. It soon became the remote control for controlling our lives. This empowerment, however, comes at a price: smartphone addiction has now become a major social problem. At the same time, digitization is further intensified. The technology push market is transformed into a pull market, driven by customers and employees demanding more digital services. Now that the phase of 'hassle' and complex technology is behind us, our eyes are opened to possibilities. In the slipstream of Apple's success, organizations discover the power of a digital mobile platform. The 'mobile first' strategy is displacing the priority of websites and support in the fixed workplace: 'mobile first' turned out to be much more than the power of always being online. The app stores became innovative platforms for organizations. New business models such as Uber's are conquering the world. The network effects on which these platforms achieve their economic success, build on the empowerment of the individual and, as Metcalfe's law teaches us, the value of the network increases with every new node added to it.

Learn & Discover AI first (2017-?) Network intelligence as the engine for a Big Data economy

Learning from the computer is the focus. Big Data is the new oil and AI the new engine on which the platforms can run. The era revolves around a smartening of the acceleration. In *Machine, Platform, Crowd*, the successor of the bestseller *The Second Machine Age*, the authors Andrew McAfee and Erik Brynjolfsson argue that we need to review all our existing ideas at this stage of computerization. More self-determination and autonomy of machines and platforms put everything in a different light. According to McAfee and Brynjolfsson, it will have far-reaching consequences for the way companies operate and how we live our lives. In their book, attention for AI is shared with two other important themes: platform and crowd. The authors call it a 'triple change': the platform economy, the AI revolution and the crowd that work together in a much more distributed manner, instead of a centralized cooperation. Blockchain technology will play an even more important role in this, according to the authors. The fact that changes come from different angles and reinforce each other, means that the greatest demands are placed on the change capacity of organizations. The tone of the book, however, is positive: there are plenty of opportunities for improvement. For the theme here, the smartening of the acceleration, this triple change is an argument for learning even faster and being open to other ways of working, learning and organizing.

The idea of an 'AI first' company is not aimed at deaf ears. Jeff Bezos, CEO of Amazon, expresses the 'why' of this next step best:

'Machine learning and AI is a horizontal enabling layer. It will empower and improve every business, every government organization, every philanthropy – basically there's no institution in the world that cannot be improved with machine learning.'

Bezos doesn't just say these words; he has for quite some time rolled out his vision in his own organization. At the front end of the company, artificial intelligence helps online consumers to make their purchases, not only by showing recommendations but also, for example, by showing what other buyers like. Autonomous robots at the back end ensure that the order is delivered as quickly as possible. Sending a parcel requires only one minute of human intervention, and with Amazon Go, they go one step further. With this new store concept, Amazon makes it possible to walk into the store, get what you need and, without having to wait in line at the checkout counter, pay your bill fully automatically.

They call it 'just walk-out technology'. Everything is tracked and automatically registered. Amazon Go uses computer vision, Deep Learning and sensor fusion. The technology is similar to that of self-propelled cars: consumers go through the shop and all actions are constantly observed. The remarkable changes in business operations and 'how we live' that McAfee and Brynjolfsson are talking about, are now becoming very real. Cashless organizations and effortless shopping are the future.

The Amazon Go store is located in Seattle underneath the Amazon head office. The beta program is now only accessible to employees. It would have been open to the public earlier, but start-up problems have delayed it. It is reported that the systems are not yet able to cope with the situation when there are more than 20 people in the shop at the same time. In China, we see



Amazon Go: check in with your mobile when you arrive, put what you need in your bag and walk away. The receipt will automatically appear on your smartphone.

similar concepts like Amazon Go. They are called BingoBox and Tao Cafe. BingoBox is a store concept by WeChat in which sensors in the store automatically put the purchases on the customer's bill. The image recognition of products and the recognition of people's faces make it possible for these stores to be run completely unmanned. There are currently 12 of these stores in China and a further 100 are planned to be rolled out. Tao Cafe is also dependent on AI (voice and facial recognition) and draws

up the bill on the basis of biometric data. Staff at the checkout counter is no longer required. It is interesting to see how the payment systems of Amazon, Alibaba and WeChat, coupled with the pattern recognition of AI, make this new buying experience possible.

Jensen Huang, CEO of Chipmaker Nvidia, shares Jeff Bezos' opinion. In his speech at the annual developer conference, he referred to a memorable statement by Marc



Tao Cafe (Alibaba) and BingoBox (WeChat) offer an entirely new buying experience thanks to AI. The intelligent network recognizes the customer based on face recognition, registers purchases and automatically settles payments.



Andreessen, founder of Netscape: 'Software is eating the world.' With this statement, Andreessen meant at the time that everything that can be automated, digitized or virtualized, will be. Huang goes one step further in his story: 'Software is eating the world, but AI is going to eat software'. According to Huang, the machine intelligence revolution has only just begun and the automotive and health industries will be the first to suffer the consequences. All other industries will follow, there is no escape.

Huang puts a lot of effort into the mantra of 'AI first'. The company has developed a new processor module, the Jetson TX2, which is as big as a credit card and yet offers sufficient computing capacity to simulate neural networks. This makes all kinds of new applications in the field of artificial intelligence possible. For example, a drone can independently search for victims by analyzing the incoming camera and sensor data in real time and automatically explore the terrain based on this. In concrete terms, this means that with this new module, every device becomes intelligent and makes independent decisions. It is the missing puzzle piece of the Internet of Things. The data generated by all these devices can now be analyzed and interpreted, allowing a device to take independent action based on the insights gained. Think also of Tesla. The car manufacturer collects the data from each car sold and analyzes all these data in order to optimize the algorithms of all self-propelled Tesla's. While Google took no less than 6 years to collect the data of a million kilometers driven, Tesla only takes 10 hours to gener-

ate the same amount of data with 70,000 cars sold: a clear example of the aforementioned smartening of the acceleration.

Nvidia clearly shows us that 'data is the new oil and AI is the new engine'. However, it is not the only company that looks at artificial intelligence in this way. Google and Apple are also trying to build artificial intelligence into a chip with the Tensor Processing Unit (TPU) and the Neural Engine, respectively. With these specially designed AI processors, also known as AI accelerators, this seems to be the start of the race for AI. A survey by CB Insights shows that in the first quarter of 2017 a total of 34 AI start-ups were purchased, twice as much as in the same period last year. Google bought 11 AI-related start-ups since 2012, closely followed by Apple, Facebook and Intel.

LEARN & DISCOVER: THE REDESIGN OF KNOWLEDGE PROCESSES

Learn & Discover goes two ways: machines learn from us and we learn from machines. We learn from each other's discoveries. Let us refresh your memory: Deep Learning is a special Machine Learning technique. Machine Learning falls under the umbrella concept of Artificial Intelligence and covers the field of learning algorithms that are trained by means of data. One of the techniques to do this is called Artificial Neural Networks (ANN) and

is inspired by the operation of our own neocortex, the wrinkled part of the brain where 80 percent of our thinking happens¹: this is where Deep Learning originates from. Improvements in mathematical models and increasingly powerful computers allow computer scientists to efficiently simulate multiple layers of virtual neurons. These deep artificial neural networks have resulted in remarkable breakthroughs in speech and image recognition.

From Merriam-Webster online dictionary, definitions of discover and learn:

discovered; discovering *play* \-'kə-v(ə-)rɪŋ\ transitive verb

1a: to make known or visible: expose
discovering himself ... as her adoring and magnanimous lover—T. L. Peacock

b *archaic:* display

2a: to obtain sight or knowledge of for the first time: find
discover the solution
when Europeans first *discovered* the Americas

b: find out

discovered he was out of gas

learned *play* \-'lərnd, 'lərnɪ\; **learning** transitive verb

1a (1): to gain knowledge or understanding of or skill in by study, instruction, or experience

learn a trade

learned to play chess
(2): memorize

learn the lines of a play

b: to come to be able
learn to dance

c: to come to realize

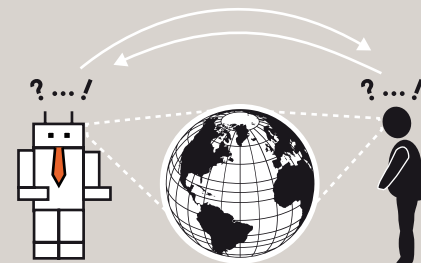
learned that honesty paid

2a nonstandard: teach

b *obsolete:* to inform of something

3: to come to know: hear

we just *learned* that he was ill

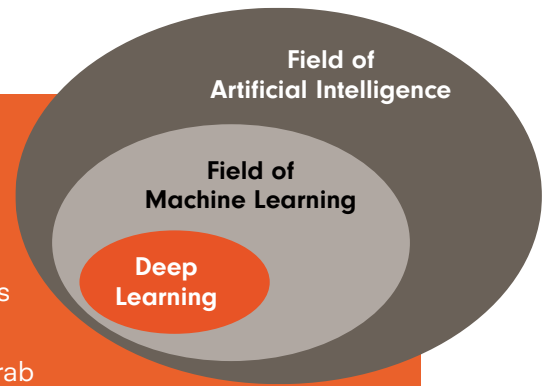


Learn & Discover goes two ways

1 <https://www.technologyreview.com/s/513696/deep-learning/>

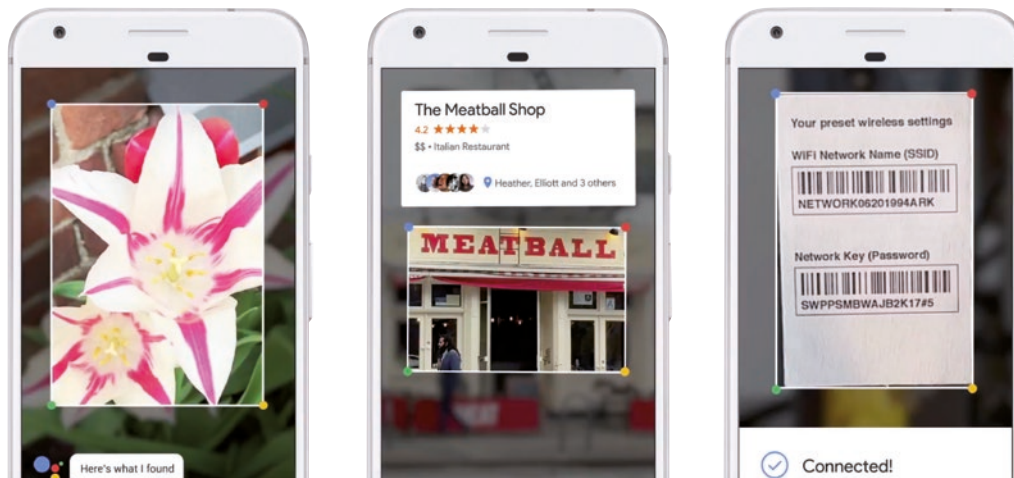
Supervised, unsupervised and semi-supervised learning

Many of the breakthroughs in Deep Learning use supervised learning: training with annotated datasets. This is different from how we as children discover the world around us. We mainly learn in an unsupervised way: we grab random things around us, put them in our mouth, learn and discover and make meaningful connections. For Deep Learning and Machine Learning in general, the successful application of this unsupervised learning – and the mixed form of semi-supervised learning – is one of the next desired breakthroughs, because although we do indeed have more data than ever before, many datasets lack a structured annotation and it is expensive and time-consuming to label the data.



The Convolutional Neural Networks in particular, which are used especially for image processing, are undergoing an enormous improvement. Initially they were used for simple handwriting recognition, but now they are used in self-propelled cars and

applications such as Google Lens. The latter works as follows: aim the camera of your smartphone at an object and Google Lens immediately looks in the same direction and identifies and interprets objects in the real world. If you point your Google



Google Lens: your camera as a new search engine. The camera recognizes the flower species by itself, knows which restaurant is on the photo and can fill in the data for the Wi-Fi connection.

Echo Look styling advice. Amazon’s intelligent camera Echo Look manages your wardrobe. For example, the assistant knows what clothes you have been wearing over the past few weeks and lets you know whether or not you have put on the right combination to wear to work.

Lens at a plant, the assistant will automatically recognize the species. If you drive past a restaurant and point the phone at the façade, you will immediately see the reviews on TripAdvisor. If the menu is written in a language you don’t know, it will be translated for you in no time. Very easy: point your phone at the SSID sticker located on the back of the router and you are automatically logged into the wireless network. In other words, the app understands what you see and how you can be assisted in the best possible way. This is how artificial intelligence transforms the camera into a new search engine.

Thanks to AI, the lenses discover the world and the world is able to zoom in or out and look at us at various levels. It happens in hospitals when analyzing an MRI or CT scan, and Facebook automatically knows

what is on the uploaded photo without you having to describe it. This is useful for the marketing machine behind Facebook, because this is how we can improve our e-profiling. Also handy: anyone who gets a camera plus AI in the form of Echo Look from Amazon, can ask for styling advice. Just try on the clothes and stand in front of the Echo Look.

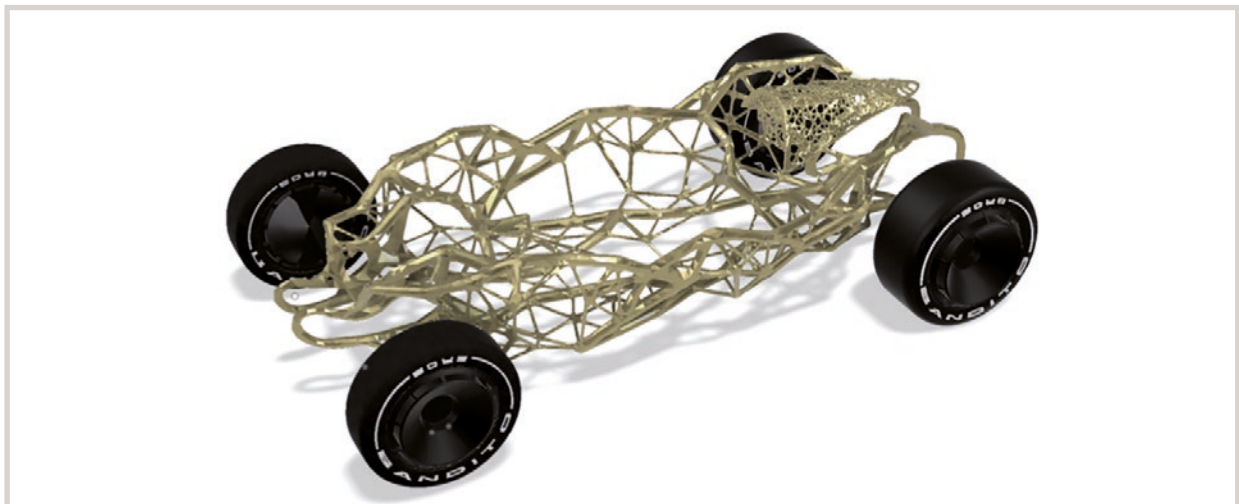
Generative Design

The new Generative Design discipline is symbolic of how we are going to learn from the computer and how this can be applied. Using AI, creative designs are automatically created for products. To do this, large quantities of data must first be fed to the design generator so that AI comes up with a design, such as a chair, parts for a new

aircraft or the sole of a running shoe. The showpiece from this corner is the Hack Rod, the world's first AI-generated car. A test car was equipped with a special digital nervous system consisting of 4000 sensors that measure the voltages, forces and heat at various places in the car and on the driver. The car was then tested in the desert at full power – the car made sharp angular bends – while the digital brain constantly generated data. This dataset, supplemented by specific requirements for, for example, the weight of the car, forms the basis on which the AI algorithm works. The intelligent software is from the company Autodesk and has been given the appropriate name Dreamcatcher. When a design choice has been made, a Machine Learning search application recommends the appropriate parts. The design is a beautiful collaboration between man and artificial intelligence.

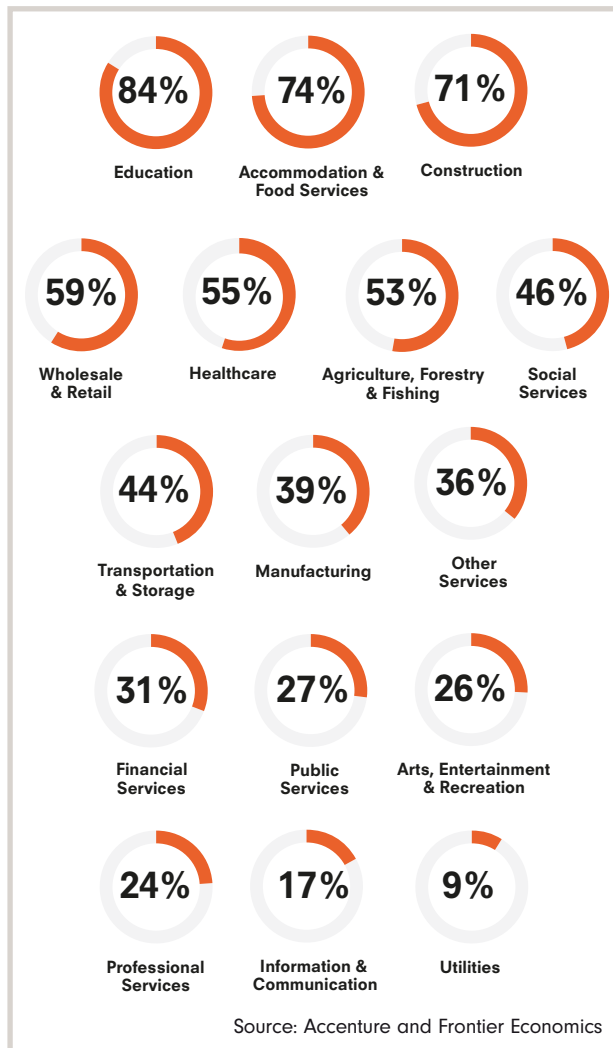
It is striking that the car's frame resembles a bone structure and is asymmetrical. Designers have known for a long time that the forces on a car that always runs the same lap, are not symmetrical (for example, a car always makes more turns to the left to drive a lap counter-clockwise). Thanks to Generative Design it is easier than ever to take this into account. Man asks the questions: what do we want to design and what are the requirements? And our technological extensions begin a voyage of discovery and come up with answers and designs that go beyond our mind. The program learns from our input and we in turn learn from the program. This is the beginning of a positive spiral around learning and discovering. It is like technology guru Kevin Kelly once said:

**'Computers are for answers,
humans are for questions.'**



The Hack Rod, the world's first AI-generated car. During the day the car drives through the desert by itself, in the evening the artificial intelligence reads out the sensors to automatically adjust the design of the car.

AI has also recently been ranked first on a global economic scale. It is the most important factor for economic growth. This is the conclusion of PwC in its recent AI report *Sizing the prize: What's the real value of AI for your business and how can you capitalise?* (2017). It reads that, thanks to AI, the economy will have grown 14 percent by 2030. This growth does not automatically benefit the existing companies entirely. The digital disruption that we have been experiencing for some time, will continue to develop. Disruptive newcomers can conquer a market with the help of AI in 10 or even 5 years.

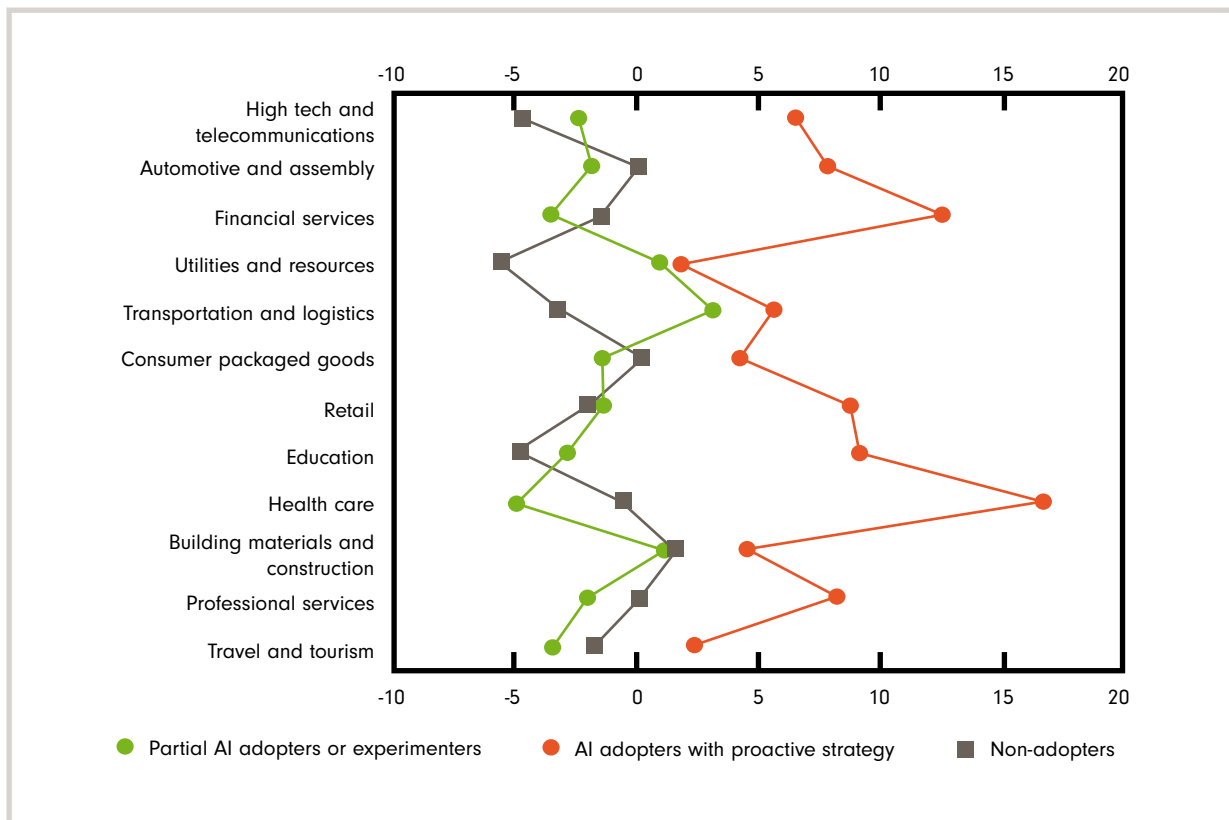


The impact of AI on profit per sector.

'The ultimate commercial potential of AI is doing things that have never been done before, rather than simply automating or accelerating existing capabilities.'

We invite you to read this report and the other reports that we will refer to here. Some come up with such accurate predictions that it is sometimes difficult to take them seriously. Take, for example, the recent Accenture study (2017).² It engaged Frontier Economics, an economic analysis agency, which predicts a total profit growth of 39 percent by 2035 when AI is deployed on a large scale. This is only an average figure, because the agency is also able to give a separate growth rate for each sector.

For the sake of clarity, we are talking about the year 2035. By then the profit in the construction sector, to mention an example, will be 71 percent higher thanks to AI efforts. The big picture is starting to become clear now that McKinsey (2017) is also presenting figures. When asked about profitability, organizations with a proactive AI strategy reported overall higher sales figures. Whether the relationship 'more AI → more profit' can be made is the question; of course, there may also be other causalities, but it is still something to keep in mind.



AI adopters are more profitable in each of the twelve sectors. Companies that have a proactive strategy towards AI are more profitable than companies that do not pursue this strategy. This effect is experienced in every sector.

2 https://www.accenture.com/t20170620T055506Z_w_/us-en/_acnmedia/Accenture/next-gen-5/insight-ai-industry-growth/pdf/Accenture-AI-Industry-Growth-Full-Report.pdf?la=en

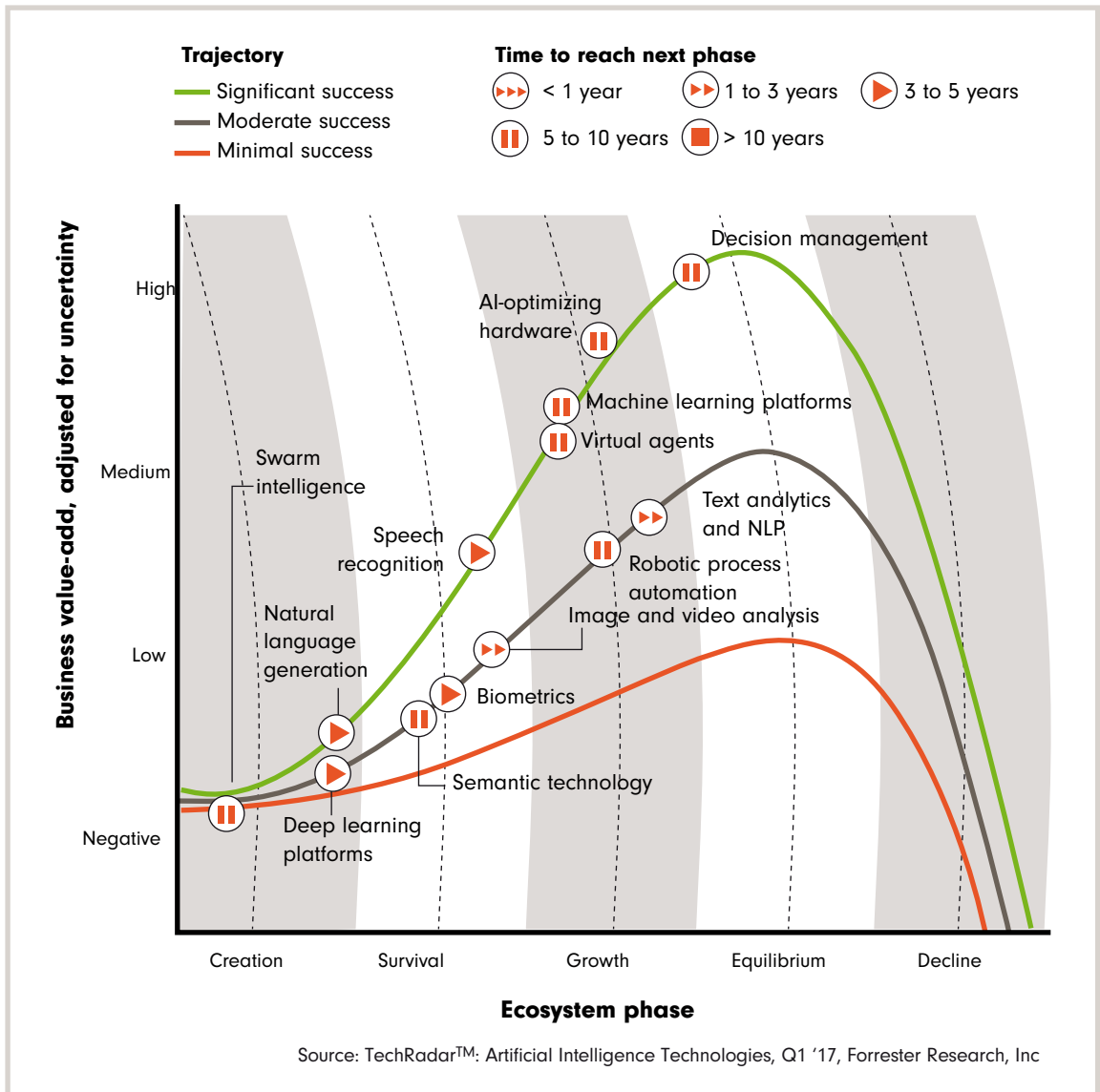
This research by McKinsey also reveals another picture. About 40 percent of the organizations still do not know exactly what AI can do for them and how they can determine the ROI on AI. This is in line with research by Forrester Research, which lists the following eleven blockades for an AI strategy:

Blockades for an 'AI first' strategy	
There is no defined business case	42%
Not clear what AI can be used for	39%
Don't have the required skills	33%
Need first to invest in modernizing data management platform	29%
Don't have the budget	23%
Not certain what is needed for implementing an AI system	19%
AI systems are not proven	14%
Do not have the right processes or governance	13%
AI is a lot of hype with little substance	11%
Don't own or have access to the required data	8%
Not sure what AI means	2%

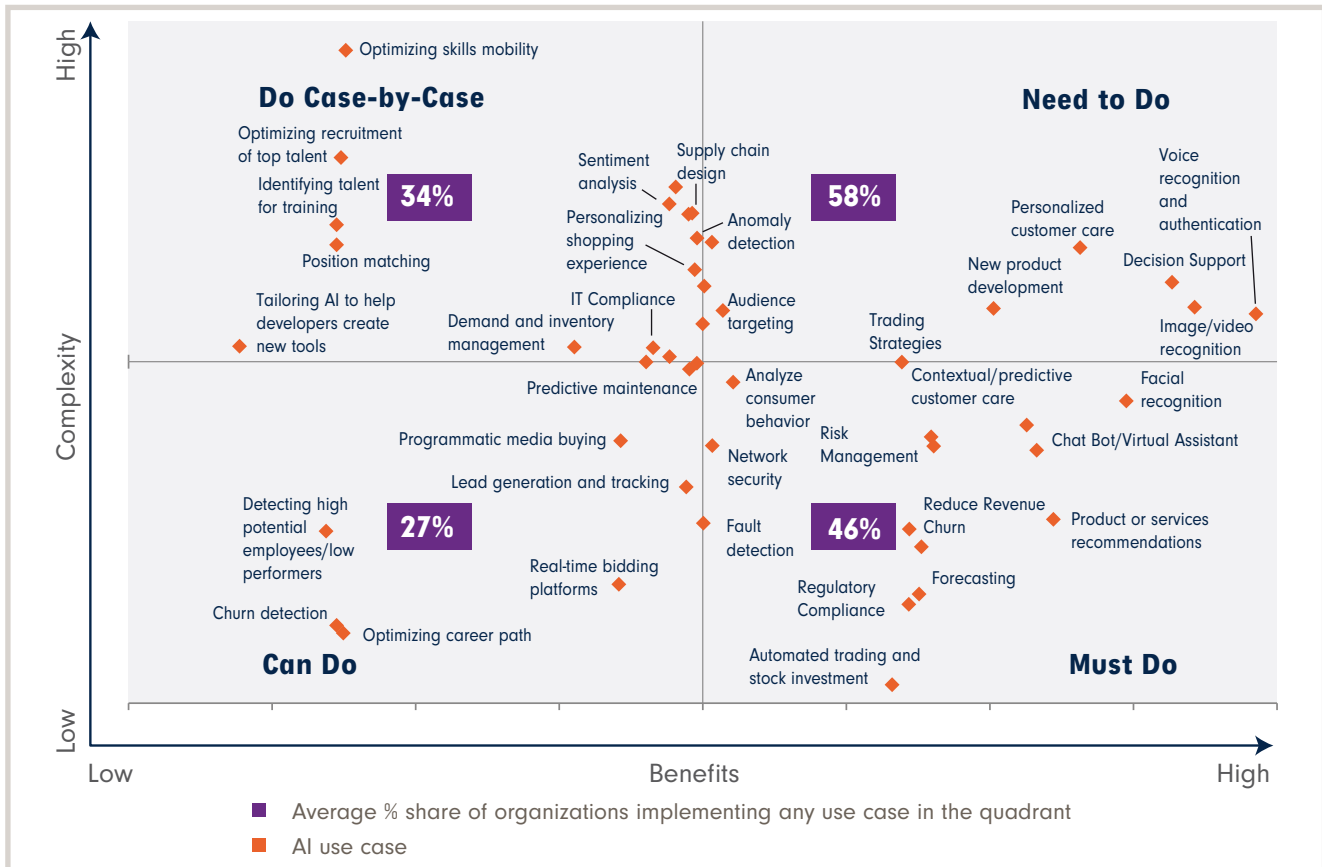
Source: Forrester Research

The blockades mentioned on this list of eleven are quite different in nature. Awareness blockades (not knowing what AI means or what it can be used for) seem to be the easiest to get rid of. Financial blockades are imposed by people themselves: no budget, no business case. This can be solved in no time at all if the will is there. Organizational blockades (not the

right governance model, not knowing what to do, lack of skills) require more time and effort. This also applies to technical blockades, such as lack of access to the right data or lack of a data management platform. Forrester concludes that once the blockades are overcome, AI accelerates the transformation.



In its TechRadar for Artificial Intelligence, Forrester Research updates the status of AI. Speech recognition and natural language generation are rapidly emerging. Most business value is expected from decision management, AI optimization for hardware, Machine Learning platforms and virtual agents.



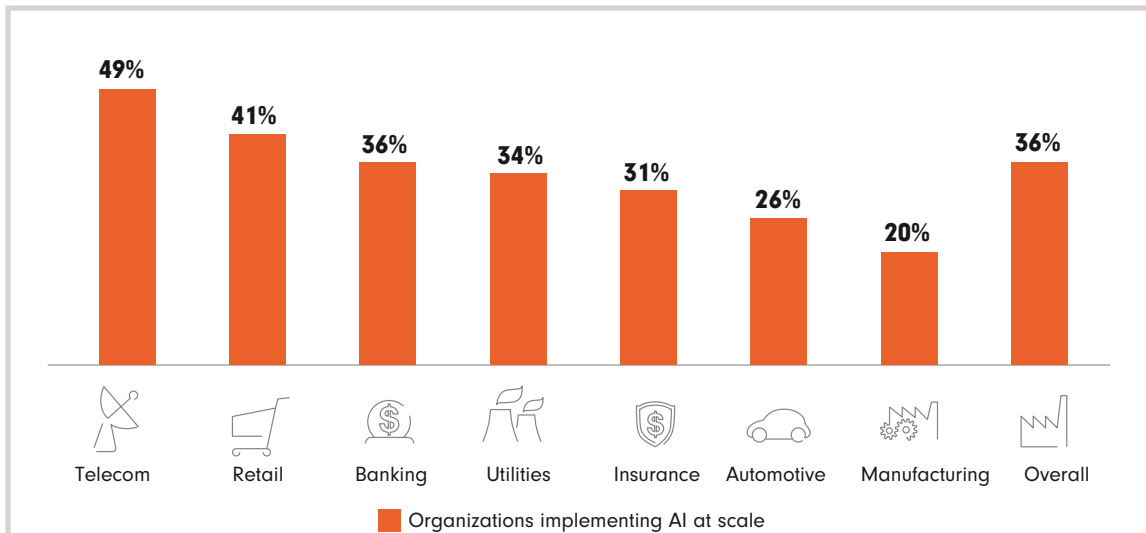
Source: Capgemini Digital Transformation Institute, State of AI survey, N=993 companies that are implementing AI, June 2017

Distribution of AI use cases by benefits and complexity. The 'Must Do's', easy-to-use, high-value AI projects are often overlooked.

The State of AI research conducted by our Digital Transformation Institute clearly shows that customer satisfaction and obtaining 'superior insights' are the two most important benefits for AI. Superior insight is of course a fluid concept: what is called superior today will soon be inferior. If the knowledge acceleration continues, superior insight will become inferior insight more quickly. A striking conclusion from this study is that AI projects that are relatively simple to implement and offer a lot of

value, are still often overlooked. Two examples of this are error detection in manufacturing in industries and bots that automatically distil investment strategies from customer emails. This category is called a 'must do' and contains the low-hanging fruit.

The same research shows that a substantial part of the organizations is now working with AI on a large scale: 36 percent of the organizations are working on AI at scale.



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

Research shows that on average 36 percent of the surveyed organizations implement 'AI at scale'. It is expected that this percentage will only increase in the future

The question of where or with what to start to apply AI at scale, is closely related to what AI has to offer. It all comes down to the ability to discover and learn. This new feature sets other things in motion, such as even more speed, more independence and more computer creativity.

Some talk about accelerating the acceleration, we call it the smartening of the acceleration. The deployment of AI ensures that acceleration can be observed in all kinds of areas. In that respect, the genie is out of the bottle. AI goes to the heart of the existence of companies. In order to remain distinctive from the competition, the entire organization needs to move forward. A standstill immediately results in decline and the question is when this delay can be

made up. In an era in which the deployment of AI is constantly changing, technology must first and foremost be better understood. In the next section we will therefore look at 'The New Fabric': the new features that we are now facing in the technological sense. Getting an entire organization involved in this smartening process, however, requires more than just a piece of technology. The Corporate IQ, the final part of this report, provides points of departure on how to get things going.

THE FIVE DOMAINS OF 'THE NEW FABRIC OF THE INTERNET'

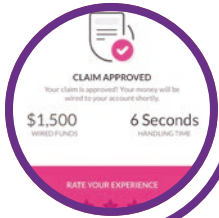
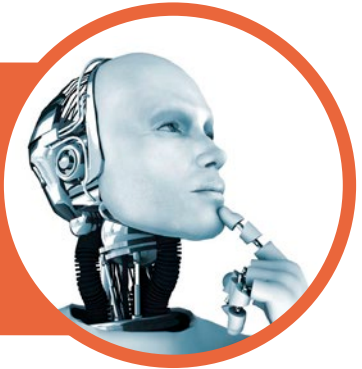
Professor Leroy Cronin's ultimate dream is to create new life out of dead material. He does this at the University of Glasgow, where he works on this challenge with a team of nearly sixty researchers. For this he built a 'chemical Google', which is a kind of chemical search engine that mixes and tests materials by itself. If any particular details are found that cannot be explained right away, Cronin receives a text message on his mobile phone. Such a message could be the beginning of pioneering discoveries about the key to life. The impact of this can hardly be overestimated. Cronin uses AI for his research, which reduces the number of experiments required to one third. Evolution does its work in hundreds of millions of years; Cronin wants to accelerate evolution by deploying AI. AI is used in laboratories all over the world to make discoveries that can amaze the world. Big Data is a derivative of Big Science, remember?

By definition, 'AI first' organizations have begun a digital discovery journey. With the discovery skills that AI adds to existing processes, products and services, it is constantly acquiring new ideas. Many of these discoveries are related to acceleration: decisions are made *in the moment* on the basis of these discoveries. Because the work of bosses is also partly taken over, organizations become less dependent on managers and their decisions. Creative

professions also get help troops. The wealth of ideas based on AI makes creativity even more creative: AI looks for new elements and mixes and combines them into original ideas. We will see these kinds of self-supporting functions more often. Knowledge from computers becomes more accessible. The ability to speak ensures that people and machines will work together better so that we can learn from machines and machines can learn from us.

Learn & Discover

AI's learning and discovering abilities are the common thread through the 5 domains of 'The New Fabric of the Internet': immediate action, conversation, creativity, autonomous action and management. Through these areas, AI strengthens and transforms the human journey of discovery into knowledge and truth.



Decide in the moment

AI processing of information on smartphones makes the network intelligent. This acceleration of smartness ensures that new and other real-time services can be offered with a solid AI component.

Insurance company Lemonade pays out its claims in 3 seconds and claims this record with Guinness Book of Records.

ING Bank wants to become the WeChat of banking.

Conversation

Google Home, Microsoft Cortana, Amazon Echo Look, Facebook Messenger, WeChat and other platforms are the front line of the conversational economy. Speech and text are sufficient to make the machines understand what we mean.



Be creative

New combinations of information flows form the basis for AI creativity. Original ideas and new insights emerge from AI. Creative jobs and tasks become more creative through AI.

McCann Erickson, Japan, uses a robot to create its commercials.

NASA lets its Mars rover decide for itself which stones it will investigate and which stones it will leave out.



Self-supporting

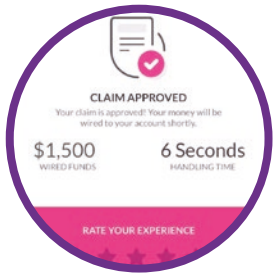
AI creates a new balance between human-machine autonomy. Decoupling points between autonomous systems and human interventions form the new UX grounds, such as the self-propelled car. The degree of autonomy and modus operandi determine the success of new products and services.



Manage

AI systems are less robust because they also work with probabilities. In this sense, AI has a more human face and the robo boss is less 'bossy' and rather engages in a dialogue. The hierarchy will consist of AI-empowered employees who rely less on managers.

Bridgewater Associates – the world's largest hedge fund – will soon have 75% of management decisions being made by robots.



Decide in the moment: insurance company chooses 'AI first'

Competition on speed between AI and non-AI systems is an unequal battle. The comparison between Amazon Go and a traditional neighborhood supermarket is a good example of this. When it comes to speed, insurance company Lemonade is something else. This application of AI now spreads like a wildfire in the insurance industry.

The start-up company Lemonade tries to shake up the conservative insurance industry by using all kinds of algorithms. At 7 seconds after 17:47 hours on 23 December 2016, Brandon Pham pressed the send button to inform his insurance company, the New York founded start-up Lemonade, that his jacket worth \$979 had been stolen. In just 3 seconds, it was checked whether

Pham's claim was covered by his policy and 18 anti-fraud algorithms checked the declaration for contradictions. At 10 seconds after 17:47, Pham was informed that his claim had been approved and had already been paid into his bank account. According to Lemonade, in the 3000 years of insurance history, a claim has never before been paid out so quickly. Although there is no reference material and the Guinness Book of World Records does not recognize the claim for this reason, Lemonade claims the title of world record holder. The record to be broken is set at 3 seconds and the start-up challenges every insurance company to break this record. It may not be an official world record, but the news put Lemonade on the map right away, all over the world. It is with good reason that Lemonade is referred to as the Uber of the insurance industry.



Conversation: the revolution from China

Anyone looking for leading examples that give an insight into the direction in which intelligence develops, will undeniably end up with chatbots, messenger platforms and the fact that we will deal with information in a completely different way. In our second report (*The Bot Effect: 'Friending Your Brand'*) of this series we already

wrote extensively about this phenomenon, which is called the eastern paradigm (due to the breakthrough of chat applications in the Chinese economy). It is also called the conversation economy, because AI enables us to talk directly to systems.

This idea has taken over ING. CEO Ralph Hamers explains in June 2017 that he wants

to become the 'WeChat of banking'. The CIO of ING Direct, Ani Paul, announces a new wave of chatbots who understand ordinary human language and talk back in the same language. The special thing about this case is that ING is not unique in this respect. Within three years, chatbots have become the most important way of interacting with customers for the entire banking sector. ING Bank's ambition is perhaps the most pronounced and special in that sense, but the eagerness with which an entire sector is plunging into this development is unprecedented. It is not surpris-

ing when you realize that the Chinese youth are now going through life without any wallets. Their physical and digital lives are largely set in the world of WeChat. From making appointments with a doctor in a hospital and consulting with the university, to paying in the supermarket, reading articles, watching a movie, booking a restaurant or taxi, everything is packed in this super intelligent chat program. Without a yuan in your pocket and with a platform as a wallet, it is logical for banks to take action.

Be creative: the Creative Genome Project

In the book *The Second Machine Age*, authors Andrew McAfee and Erik Brynjolfsson describe how technology no longer only replaces our muscular strength, but increasingly also takes over our brainpower. These robots mainly take over routine work from people. According to the authors, human creativity prevents robots from taking over our tasks in full. However, developments have not stood still. Since the publication of the book in 2014, there have been various examples of good practice that show that AI can perform creative tasks, as evidenced by a neural network that reviewed the entire catalogue of The Beatles and composed a new Beatles song based on these data.

McCann Erickson Japan is the first advertising agency that opened the doors of the

boardroom for AI. He or she is called AI-CD β and is formally the new creative director. The real

work of the algorithm consists of building storyboards for new commercials. For example, AI-CD β made an advertisement for Clorets, a mint, that competed against a human-made commercial. It was a close finish, but the human team defeated the algorithm. Nevertheless, the first creative steps of AI in this billion-euro industry have been taken. Shun Matsuzaka, the creator of AI-CD β , talks about the Creative Genome Project; he is convinced that the future in this creative sector lies with people who build smart algorithms. President and CEO of McCann Worldgroup Japan, Yasuyuki Katagi, said the following:



'Artificial intelligence is already being used to create a wide variety of entertainment, including music, movies, and TV drama, so we're very enthusiastic about the potential of AI-CD β for the future of ad creation. The whole company is 100 percent on board to support the development of our A.I. employee.'

AI also shows its creative character in outdoor advertising. A competitor of McCann, M&C Saatchi, has created an intelligent display which composes the advertisements in bus shelters on Oxford Street in London. Background, font and pay-offs of the product are generated based on the reactions of the people looking at the advertisements. According to M&C Saatchi, this self-learning database is scratching the surface of the AI potential in this so-called out-of-home arena of advertising space. The agency says that in the near future, AI will take on more and more of these creative tasks.

Commercial by AI-CD β. These are images taken from a commercial made by an algorithm. An artificial intelligence took over the work of the creative director and devised an advertisement for menthol sweets. It is expected that in the future, AI will increasingly perform creative tasks.



Self-supporting: the Mars rover knows best what to do

You can also expect such discovery skills from NASA, which investigates existing planets and discovers new ones. A remarkable example of this is actually about another concept: autonomy. The Mars rover Curiosity rides on Mars almost independently. It chooses stones without the intervention of its programmers to examine their composition with its ChemCam, also called SuperCam. The Mars rover has to do this by itself, because with its limited RAD750 processor with a working memory of only 16 megabytes and a delayed connection to Earth over which relatively little data can be transmitted, the robot has to rely on its own computer power. A paper in

Science Robotics of June 2017³ praises the quality of the AI system. The hit rate is 93 percent, which means that the camera has made the right decision in almost all cases whether or not to examine a certain stone. The Mars rover is of course in sharp contrast to the self-propelled cars of Tesla. These are not bound by the data restrictions. These cars do have access to the latest processors and a real-time connection to the cloud. But NASA's SuperCam turns out to be so good in quality that it has already been decided to equip the new mission with the same camera in 2020.



Manage: The Book of the Future

You need managers and bosses to organize business well. Thanks to AI, this is needed less and less. We already saw this with the algorithms of platform companies such as Uber and Airbnb. You don't have to set up a hotel chain or a full taxi company if you can also put the organizational part in an algorithm. These platform companies are now also using AI on a large scale to better serve customers and make the business run smoother. Platform organizations are therefore less 'bossy', a development that is now being followed in more traditional companies.

Ray Dalio, chairman of the board of the world's largest hedge fund Bridgewater Associates, managing some 160 billion dollars, is in a hurry to replace the company's managers with algorithms. He composed a team of engineers under the inspiring leadership of David Ferrucci, who was previously responsible for the development of IBM's supercomputer Watson. The title of the project is 'The Book of the Future'. In 5 years time, 75 percent of the strategic decisions must be taken by a computer program, and in



10 years time, the role of the chairman of the board will have disappeared. Dalio then only wants to watch from the sidelines how his business is run entirely independently by artificial intelligence. This idea is not as crazy as you think: as early as 2014, venture capitalist Deep Knowledge Ventures from Hong Kong, for example, announced that it was the first company in the world to appoint a software program as a board member. The program has the same decision-making power as the human board members. VITAL is the name of the new board member: Validating Investment Tool for Advancing Life Sciences. The program was developed by the company Aging Analytics UK. The program is not part of the board meeting, but it does provide these meetings with the necessary input to make better investment decisions. Human intuition combined with machine logic forms a perfect team, according to Dmitry

Kaminskiy, senior partner at the company. This is how the risk of taking incorrect decisions is drastically reduced.

At an entrepreneurial conference in Zhengzhou, China, in the summer of 2017, Jack Ma, CEO of Alibaba, said that 'in 30 years time, a robot will be the best CEO on *Time Magazine's* cover'. According to Ma, an artificially intelligent CEO is a better CEO than its human equivalent: 'It remembers better than people, counts faster and will not get angry with competing companies.' Jack Ma has a point. An artificial CEO cannot get angry. Computers know neither consciousness nor emotion. In terms of memory and processing power, they are many times better and they do not suffer from so-called cognitive biases (we are often wrong with our estimates). That last point should certainly have been mentioned by Jack Ma in his speech at the entrepreneurial conference.

McAfee and Brynjolfsson warn that the simple sum 'company X + AI = Smart X' does not apply. But what does apply? As is so often the case, things are more complicated when people are involved. The sum must therefore be: 'company X + AI + HI = Smart X', where HI stands for Human Intelligence; or even better: 'company X + (AI × HI) = Smart X'. The human-times-machine interaction, in particular interaction between people and machines that are 'human-like', will play a crucial role in the success of a Smart X. This cleverness of the organization, called Corporate IQ, can be enhanced especially if we understand the relationship between man and machine better. We will provide you with six starting points for increasing the Corporate IQ. It should be noted that there is little experience with this; now that AI from the laboratories is entering the 'real world', we will undoubtedly still be confronted with many surprises.

1 Give your organization a cognitive power boost

When presenting the cases, we called it 'The New Fabric', the new material to help shape the organization. It is material that learns, perceives and can be creative, and as we read in the cases, works independently, works on great discoveries and is given the ambition to even become the CEO of the organization one day. In *The Science of the Artificial* (1969), Nobel Prize winner Herbert Simon is anticipating this new topic. At that time, there were no neural engines on smartphones and the cases we are presenting here were still pure science fiction. Nevertheless, Simon reminds us that the world is largely artificial. Everything that man has created is artificial by definition, from cars and egg spoons and houses, factories and organizations to planted forests and canals. The

artificial brain seems different, but in principle it is just as much an artifact as any other. Like all human fabrications, it is an interface standing between man and nature. Herbert Simon's AI classic mainly analyzes the cognitive capacities of the artificial brain, and in particular, memory storage and data processing. From his research into the cognitive abilities of the human brain, he concluded that the human being's data processing capacity is extremely limited. We learn from Simon that the computer as a memory support is a powerful improvement in the development of our own knowledge: a cognitive power booster. But like we already mentioned: it is more complex than that. There is also something like affection and emotion and our relationship to this new 'artifact'.

2 Let machines be mindless and people be mindful

Those who google the word 'machinefulness' won't find much more than some references to how much clothing you can put in a washing machine. Machines cannot be mindful, because they have no mind. They do have a database, but not an autobiographical memory or unprocessed problems from their childhood that they should discuss with a psychiatrist. They do tirelessly search for stones on Mars, analyze our facial expressions in a split second or effortlessly generate storyboards for a new commercial. On the other hand, there is human mindfulness, which is so scarce today: we are less and less aware. The well-known organizational psychologist Karl Weick was the first to underline the importance of mindfulness and alertness for organizations. The title of his book *Managing the Unexpected* (Weick & Sutcliffe, 2007) is based on the underlying reason. Managing unexpected things requires a certain state of mind and attention.

'Mindfulness is a mental orientation that continually evaluates the environment as opposed to mindlessness where a simple assessment leads to choosing a plan that is continued until the plan runs its course.'⁴

More and more unexpected things are awaiting us than ever before and this is partly due to the learning acceleration caused by AI. The insights this cognitive power boost brings us should not go unnoticed. In times of great change, it makes sense to have enough people with discovery skills in-house, in addition to the delivery skills that dominate in many organizations: people who are open to change and oversee the holistic whole versus the routine employees. Pausing for reflection and thinking carefully about what is needed without judging directly is a typical characteristic of human intelligence. Harvard professor and mindfulness expert Ellen Langer uses the following definition: 'Mindfulness is the process of actively noticing new things.' The most common definition of mindfulness is:

'Paying attention in a particular way: on purpose, in the present moment, and non-judgmentally.'⁵

Machines also pay attention to 'in a particular way' and 'on purpose', but that purpose is inspired or coded by people. AI cannot set targets for itself, and that is the first place where mindfulness must play a role. The machines always judge, and we have designed them to do so. And in these mindless judgments they defeat us in terms

4 <http://high-reliability.org/Weick-Sutcliffe>

5 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4350240/>

of speed, awareness and accuracy in many areas. However, the required mindfulness in organizations does not come about automatically. The trend is the other way around: more hectic, work harder and constant loss of self instead of peace and slack time for contemplation. That is what

people do most of all for themselves, and this is further reinforced by the smart deployment of AI by platforms such as Facebook, which has a post or like ready on our mobile phone for every free minute of thought.

3 Computer humility, no computer humiliation

People are often distracted and that leads to constant errors of judgment, errors that are not quickly made by computers because attention is hard-coded in their system. This is where AI outperforms HI. We learn this from the work of Nobel Prize winner Daniel Kahneman. In his latest book *Thinking Fast and Slow*, he collected all the research he had done for decades, together with Amos Tversky, into how we, as people, make decisions. This research field is about heuristics, about how people go through their plans before they come to a decision, in other words: the human algorithm. The AI algorithms are much more attentive than the human predecessors. The self-propelled car is slowing down, and Professor Cronin's chemical Google sends an app to Cronin's mobile phone if unexpected results occur, conscientiously and inexhaustible, day and night. However, the carelessness of people's actions does not lead to accidents by definition. The two modes of the brain, fast and slow – according to the title of the book – both have a function. The fast brain reacts intuitively to the autopilot so that

we can quickly make a decision when something dangerous is in our way. But this often leads to errors or cognitive biases. The slow brain – slow thinking – makes fewer mistakes, but we do not use that too often, not in the least because it requires a lot of energy. In important decisions, however, we need to think deeply about it. Distressing cases from Kahneman's book show that this is not always the case. An examination of judges' decisions as to whether or not a person is granted early release from prison, shows that the fast-moving brain often wins over the slow. The conclusion is that you are unlucky if the judge thinks fast. One year longer in prison due to the inattention of the judge is, of course, a tough affair.

AI can play an important role here. The total IQ of the organization can be raised if the machines become alert as soon as there is fast thinking. AI × HI is the Corporate IQ here. But how do you explain to a judge that he has systematically made mistakes for years? Do we accept that AI

can help us take the entire Corporate IQ to a higher level?

One of the articles about AlphaGo's performance had the catchy headline 'Being humbled by the machine', although the line between humility and humiliation is vague. We will experience this being humbled more often. But in doing so, however, we must stop seeing the performance of AI as a personal defeat. The way out of this deadlock lies, among

other things, in the distinction between what man can and cannot do. It must be clear to machines what tasks they are used for. As we read earlier, machines need clearly formulated goals that leave no room for interpretation. This automatically leads to our next and most difficult point: how do you introduce this new material, this new actor, into the playing field of organizations? How do you construct knowledge from the collaboration between man and machine?

4 Constructing knowledge

The earlier mentioned organizational psychologist Karl Weick believes that knowledge construction or sensemaking is a relational process. An individual picks up information from the machine, connects to his or her mental model, selects and indicates whether or not it is meaningful. It is the machine's art to send information that touches you: customized, personalized and 'in the moment'. With AI, the machine will be able to do this better and better, it 'learns' it automatically and no learning module can top that. This information should and must be absorbed; mindfulness is needed here. Otherwise, there is a great risk the machine's information will pass you by or you will fail to make a connection; you don't understand it and you missed

another opportunity. Information from the AI machine will also be of increasing value. By the way, the learning AI machine does not wait for you.

Making a connection does not have to happen in the moment, that can also be done later, in the shower, during a walk. It is important that you accept it and that you connect through focus and change your mental model. You can choose to take the time and room needed: something new can then come into being and you give that back to the machine and to your teammates. This feedback triggers the machine again. Knowledge creation happens in the collective. The new Collective Intelligence will also be the result of this kind of human-machine collaboration.⁶

6 Doug Engelbart, the inventor of the computer mouse, was the first to use the term Collective Intelligence. For more information about collective intelligence, please refer to the Doug Engelbart Institute (<http://www.dougenelbart.org/about/collective-iq.html>) and the MIT Center of Collective Intelligence (<http://cci.mit.edu/>).

Weick represents the school of social constructivism, an interesting counterpart of cognitivism which Daniel Kahneman and Herbert Simon are part of. If knowledge is indeed present in relationships and connections – for which Weick coined the word ‘enactment’ – then the first question is what these actions of smart computers look like to us. If we follow Weick’s line of thought, then the way in which we define the goals for the smart machines, shape the process and determine who is involved or not, is also part of the knowledge construction. This quickly becomes more blurred and difficult. But the fact that machines are becoming smarter and we can learn from them, does not mean that other matters such as the role of leadership, team spirit, culture and storytelling are suddenly no longer important.

But how do you build a team of smart people and smart computers? With a cognitive view on cognitive machines, we will not find a solution. In his books *Sense-making in Organizations* and *Making Sense of the Organization*, Weick explains that people in organizations are constantly monitoring their environment. How do I relate to the new events? Is artificial intelli-

gence something for me or should I stay away from it? We usually do this in retrospect, based on our experiences. As mentioned before, we have little experience with artificial intelligence. Rather, we will rely on other signs, on what is written or said, and who says it and whether we can trust that person. It goes too far to fully explain the complex theory of constructivism here, but we would like to give you this view (and perhaps it inspires you to read more about Weick). We would, however, like to emphasize one point, certainly because we have paid so much attention to this in our previous AI report. Artificial intelligence is a *Fremdkörper*, a phenomenon that we feel attracted to but which also incites fear. It is, in the words of Freud, *unheimlich* (uncanny) – that in the sense of the word refers to both familiar and secret. A machine is not a human being, but it is more and more like a human being, especially now that it can speak and interpret. In Weick’s theory, in which all knowledge is present in relations and interactions, the action and reaction between AI and HI, how we behave towards each other and whether we can trust each other, is crucial for the formation of knowledge.

5 Take the FrankensteinFactor into account

Can we trust robots? Will they ultimately turn against us? Fear of automata and androids, right or wrong, plays an important role. The IQ of organizations cannot be seen in isolation from the EQ, the emotional intelligence. This was the topic of our previous report, *The FrankensteinFactor*. We wrote about the importance of psychology, the role of our existential fears in relation to artificial intelligence, but also the attraction to the artificial other. Whether the robot has a body (embodiment), what form it has, the tone of the voice, the way it conversates, all these things are important to make the AI × HI work optimally. How do you compare to the machine when it is sitting at the table as a full-fledged team member during the sprint meeting? Or, thinking of McCann

Erickson's creative director AI-CD β, will the proposals he makes for a commercial be accepted sooner than those of a human art director? What role would the design of AI-CD β play in this? Does he have a voice, for example? And how do the team members react to each other now that an artificial creative spirit has joined their team? Or what about Eric Loomis from Wisconsin? He was sentenced to six years in prison because software analyses showed that he had a high chance of repetitive behavior. Loomis then stated that he had no fair trial, because it is not clear how 'secret algorithms' came to that conclusion. This *unheimlich* relationship (the secret and mystical behind the algorithms) and other connections are described in detail in our report. You can download it [here](#).

6 Take part in bimodal AI

In many organizations, most even, AI does not play an important role. There is a lack of experience and knowledge, there is no budget or business case and there is a lack of awareness on a wide scale. The first simple advice is: get rid of the blockades. The second advice reads: do not wait, do not hesitate to start on two fronts at the same time, Horizon 1 and Horizon 2. Take part in bimodal AI.

We have seen that there are also 'must do' projects that can pay off quickly. We are in favor of bimodal AI, which can work on both modalities at the same time. An important lesson that the whole history of AI has taught us is that our expectations have always turned out differently, especially over time. It is impossible to predict exactly how things will turn out when Learn & Discover is applied on all fronts.

Gartner has been advising organizations to implement a bimodal IT strategy for a number of years. To continue to meet the business demand, organizations would have to deliver IT at two speeds. Part of the IT that is aiming for stability, does not need to change quickly, while the part that is responsible for accelerating business, needs rapid change. This is how bimodal IT offers the best of both worlds: both the requested speed and stability can be delivered.

Bimodal AI can be a solution to manage AI in two different directions: incremental

and disruptive at the same time. Both flavors are requested by the business from IT, but require a different approach, competence and mindset. In the existing processes, robot process automation or an advanced form of process mining, for example, can offer solutions. The incremental improvements that can be realized this way can be realized in Horizon 1. The more disruptive innovations require a different mindset and competence, but will have to be supported by IT just as much. These two business questions form the basis of bimodal AI.

Bimodal AI		
Horizon 1		Horizon 2
Faster & cheaper processes	← KPI's →	Disruptive models
Business model continuation	← Approach →	Business model change
Industry competition	← Playing Field →	Cross industry competition
Low	← Risk →	High
Efficiency driven	← Drive →	Innovation driven
Improving what's already there	← Scope →	Building from scratch
Fast	← Potential Acceleration →	Faster
Short term	← Presumed Future →	Long term

CONCLUSION: AI FIRST, HUMANS SECOND?

How realistic is the chance that mankind will lose out? That 'AI first' somehow ends in a fiasco? Since the publication of our report *The FrankensteinFactor* earlier this year, the debate on this issue has been reignited. In July 2017, Facebook pulled the plug from an AI project in which two bots that were debating with each other, invented a 'new language'. The story was blown up in the media. Facebook's blind panic would have been the reason to stop immediately, Skynet's doom scenario, the life-threatening robots from the film *Terminator*, came real close. The down-to-earth truth, however, is that the bots were going to use a kind of street language to make the game of negotiating with each other about the exchange of certain things more efficient. Facebook is not interested in this robot slang because their negotiating robot should be able to talk to people very well. That is why they stopped the experiment.

This type of anxiety reaction is always close to the surface of AI. More than with other technologies such as the car, television and refrigerator, AI has the ability to evoke these uncomfortable feelings (*uncanny* in English, *sinistre* in French, *unheimlich* in German). 'Das Unheimliche' by Sigmund Freud from 1916 explains it very well: it is the familiar and unfamiliar of AI that can cause the agony. The double meaning of *heimlich* (confidential and secret) is the cradle for speculation and emotions that is taking us for a ride. At the very least, this obscures a clear view of the AI future.

Nevertheless, there is a multitude of people who warn us that 'AI first' will irrevocably lead to 'humans second' (or worse still: game over for the human species). Elon Musk, the boss of Tesla, and Mark Zuckerberg have fought about this through social media. The feud started with a Facebook Live broadcast of Zuckerberg from his own backyard. While

in the background a piece of meat is smoked on the barbecue, Zuckerberg responds to a question about Musk's fears for AI. This led to an advertising broadcast for artificial intelligence that lasted several minutes: healthcare becomes affordable, the number of road deaths is kept to a minimum, AI can improve and make people's lives easier on so many fronts.

In his video, Zuckerberg calls Musk's attitude irresponsible. If you are against AI, then you are also against saving human lives. Musk responds on Twitter saying that he spoke with Zuckerberg and that Zuckerberg doesn't understand AI at all.

Fear of AI certainly helps us keep an eye on things. In many media and conference venues where the latest state of the art is discussed, social desirability of artificial intelligence is becoming a frequent topic. Now that almost everything seems

technologically possible and becomes financially feasible, the question remains: what do we, as individuals and society, want to do with this? This was the trigger for our new research series 'In Pursuit of Digital Happiness'. The central question is how the wellbeing of citizens and consumers can be promoted in the current state of technology. Digital Happiness is the compass, the strategic glasses to see digital activities as they are. The organization acts as a guardian of the happiness that digital technology can provide their customers. This won't sound strange to Zuckerberg.

In other words: you can expect more reports from us about Digital Happiness. Mark Zuckerberg may come back as president of the United States. After he went on a tour in the so-called swing states to visit factories and talk to employees, and hired the political strategist from Clinton and Obama, speculations about Zuckerberg running for president are far from over. It would be very special if Zuckerberg were to end up in the White House. In any case, it would bring a brightly colored AI future, about which he spoke so passionately from his own backyard, a little closer for the whole of America and the rest of the world.

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