

VITO DI BARI

# WELCOME TO THE AI TRANSFORMATION



*"Di Bari's scheme of digital innovation strikes me as remarkable"*  
[Lawrence Klein, Nobel Prize for Economics]



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# WELCOME TO THE AI TRANSFORMATION

**HOW TO INSPIRE YOUR ORGANIZATION  
TO EMBRACE THE AI TRANSFORMATION.  
A GUIDELINE FOR C-LEVEL EXECUTIVES  
ON HOW TO SUCCESSFULLY INTRODUCE  
AI IN BUSINESS.**

*Edizione Limitata  
per Lantech Longwave*

Palo Alto Books  
Santa Clara, California

Dedicato ai miei nuovi amici  
di Connect Up 2024  
Benvenuti nel futuro!

A handwritten signature in blue ink, consisting of a horizontal line followed by a stylized, cursive-like mark that resembles the letters 'V' and 'D'.

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*One of the three most influential futurists in the world, along with John Naisbitt and Alvin Toffler.*

*[Encyclopedia of Speakers]*

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## Understanding Key AI Terminology

As the field of Artificial Intelligence expands, it's essential to familiarize ourselves with key terminology. Here are ten fundamental terms to aid in understanding AI:

### 1. Algorithm:

An algorithm refers to a set of rules or instructions designed to solve a specific problem or perform a task. In the context of AI, algorithms play a crucial role in Machine Learning and Deep Learning systems, enabling the models to process data and make predictions.

### 2. Machine Learning:

Machine Learning is a subset of AI that focuses on enabling machines to learn from data and improve their performance without being explicitly programmed. It involves the development of algorithms that can automatically identify patterns, make predictions, and learn from feedback.

### 3. Deep Learning:

Deep Learning is a specialized branch of Machine Learning that utilizes Neural Networks with multiple layers (deep Neural Networks) to process and analyze complex data. Inspired by the structure of the human brain, Deep Learning has achieved remarkable success in areas such as image and speech recognition.

### 4. Neural Networks:

Neural Networks are computational models designed to mimic the interconnected structure of the human brain. They consist of layers of artificial neurons (nodes) that process and transmit information, enabling the network to learn and make predictions.

### 5. Supervised Learning:

Supervised Learning is a type of Machine Learning where the model is trained on labeled data, meaning it is provided with inputs

and corresponding desired outputs. The model learns to make predictions or classifications based on this labeled data.

#### 6. Unsupervised Learning:

Unsupervised Learning is a type of Machine Learning where the model is trained on unlabeled data, meaning the input data is not accompanied by desired outputs. The model learns to identify patterns or groupings within the data without explicit guidance.

#### 7. Reinforcement Learning:

Reinforcement Learning involves training an AI agent to make decisions in an environment through trial and error. The agent receives feedback in the form of rewards or penalties based on its actions, enabling it to learn optimal strategies over time.

#### 8. Natural Language Processing (NLP):

Natural Language Processing focuses on enabling computers to understand, interpret, and generate human language. NLP techniques are used in applications such as chatbots, language translation, sentiment analysis, and speech recognition.

#### 9. Computer Vision:

Computer Vision involves teaching computers to interpret and understand visual information from images or videos. It enables tasks such as object detection, image classification, facial recognition, and autonomous driving.

#### 10. Artificial General Intelligence (AGI):

Artificial General Intelligence represents the concept of AI systems that possess human-like intelligence and can understand, learn, and apply knowledge across different domains. Unlike narrow AI, which excels at specific tasks, AGI aims to replicate human cognitive abilities and perform a wide range of intellectual tasks with flexibility and adaptability. Achieving AGI remains a long-term goal of AI research and presents significant technical and ethical challenges.

# INTRODUCTION TO AI

## If I Only Had a (Bigger) Brain

The neocortex is the part of the human brain that invents new behaviors, rather than having to rely on fixed behaviors, as non-mammalian animals do. In the future, nano-bots will connect our neocortex to AI. It's not as complicated as it sounds. Today, we use a computer to connect to the cloud to access more storage or more processing power. Fifteen to twenty years from now, we will simply connect to the cloud directly from our brains. We will have more "brain," or in other words, literal Artificial Intelligence. As a consequence, our thinking will be a mix of biological and non-biological thinking, with the non-biological portion growing exponentially.

Now consider this: the last time we expanded our biological neocortex was almost 2 million years ago. Our ancestors developed foreheads larger than other primates when *Homo erectus ergaster* was born. The word "ergaster" comes from Ancient Greek and it means "workman." They earned this name from their propensity for making tools out of stones. They were responsible for what we call "lithic technology," which was the first huge leap made by our species. During the same period, there was also a sharp decline in the number of large carnivorous species. There were previously eighteen large carnivorous species, but *Homo erectus ergaster* decimated all but five of them. They were their predators as well as their hunting competitors. The last time our ancestors expanded our biological neocortex, we started to use new technologies. The development of the neocortex was just a quantitative expansion of the frontal cortex that we already had—yet we moved up the food chain in a sudden pounce.

Now think of what will happen when we expand our neocortex again; this time through a non-biological means—Artificial Intelligence. As alien and strange as this sounds to us, it isn't

something to fear. By managing everything through Artificial Intelligence, we will not be surrendering control as some worry, but rather we will be freeing ourselves from the burden of repetitive tasks—in much the same way as tractors transformed agriculture for the better and assembly lines improved factories.

Our behaviors will be indexed by artificially intelligent devices that predict our wishes. Algorithms inspired by the human mind will analyze a volume of data far too vast for the human brain alone. In the same way that we learn from experience, the Deep Learning algorithms—which we will discuss in more detail later—will perform a task repeatedly, each time tweaking it a little to improve the outcome. As a consequence, we will exponentially expand the potential of our brains.

### Artificial vs. Human

When we think about intelligence, we see it as a whole; as a one-dimensional skill. In my opinion, the concept of an Intelligence Quotient (IQ) is completely wrong. I don't believe there is such thing as a single measure of IQ or general intelligence. According to American psychologist Howard Gardner's Theory of Multiple Intelligences, we actually have nine different types of Intelligences: Naturalist Intelligence (nature smart), Musical Intelligence (music smart), Logical-Mathematical Intelligence (number-reasoning smart), Existential Intelligence (life smart), Interpersonal Intelligence (people smart), Bodily-Kinesthetic Intelligence (body smart), Linguistic Intelligence (word smart), Intrapersonal Intelligence (self smart), and Spatial Intelligence (picture smart). I would like to propose the addition of a tenth type: Emotional Intelligence (empathy smart) as described by American psychologist, Daniel Goleman.

Around one hundred different types of skills merge into these ten intelligences, and each one of them vary in different degrees of prevalence for each one of us. This changes everything. We move from a world of black and white, of this or that, of be-

ing categorized as stupid or intelligent and claiming, “my IQ is higher than yours,” to a wide array of colors and the combination of different degrees of many intelligences and skills. That’s the wonderful imperfection of being human: we are all so different from each other. How could we be so foolish as to think that one numeric description could fit us all?

As an example, let’s try to answer the question, “Are we more intelligent than animals?” If we look at the sum total of all skills, the answer is a resounding yes. No doubt about it. But if we break it down into the different categories the answer is quite different. Chimpanzees have as much, if not more, emotional intelligence than most of us. They even grieve their dead like humans do and hold wakes for them. Homing pigeons and bats have significantly more spatial intelligence. Homing pigeons can travel over eleven hundred miles and find their way home, and bats can orientate in dark caves using their ears as radars. Elephants have more interpersonal intelligence. They can identify threatening people by their scent alone. And how about the linguistic intelligence of ants? They communicate using pheromones to “talk” and antennae to “listen.” If a lone ant is attacked, it will emit a pheromone detectable by thousands of members in its colony to alert them to join in the fight.

In addition to intelligences, let’s look at animal skills too. A squirrel has an incredible long-term memory and is able to remember where it buries its nuts year after year. Worker ants only get four hours of sleep and work the rest of the day with short power naps in between. Usain Bolt became the fastest man on the planet, reaching a speed of twenty-eight mph in the one hundred meter sprint, yet this is nothing compared to the peregrine falcon, which can easily reach two hundred miles per hour. An eagle can see a rabbit from up to three miles away, with vision eight times more powerful than the average human.

Now, let me ask you a question: would you like to have the memory of a squirrel, the stamina of an ant, the speed of a falcon, and the sight of an eagle? And all this without losing anything of

the human skills you already have? I cannot imagine many of you would answer no.

So let's go back to AI. If we forget the concept of a one-dimensional IQ and instead look at intelligence as the sum of all our knowledge and skills, the essence of our relationship with AI changes completely—it's no longer a matter of quantity; it's a matter of quality. It's adding more knowledge and skills without losing any of the ones we already have. Does that sound more appealing now? Human intelligence works as a symphonic orchestra composed of many different instruments of cognition. If we add instruments to our orchestra to enrich the execution of the same symphony, how can that be a bad thing?

This is already happening. Calculators are more skilled than we are in mathematical intelligence, GPS in spatial navigation, Google in long-term memory, Shazam in musical intelligence, Fitbit in bodily intelligence, and Google Translator in linguistic intelligence. And do you know why these apps don't scare us? Simply because nobody had the idea to refer to them as "Artificial Intelligence" and so we don't fear losing control of them.

### Who Should Take the Wheel?

In the past, human judgment was the only decision maker in business. Experience, expertise, and gut instinct reigned supreme. But now, AI is meant to help us make even better decisions than we could alone. Sure, some people are scared of this, but they will get used to the idea. Keep in mind that, not that long ago, humans were the sole data processors until computers and search engines came along to help us process data more efficiently. This was not perceived as a threat because computers and search engines were not "autonomous." They both still needed humans to synthesize and make use of the data.

Now, AI will allow computers to process data up to the point of decision making. In doing so, it will surpass the human brain for processing routine decisions. This is nothing new

though; the same thing happened with the calculator. My father did his math by hand, and while I need more time to do it myself, my teenage sons don't even try—and for good reason. They have calculators on their phones and computers, which they have unlimited access to. Why bother doing the calculations themselves?

Can AI make decisions without human judgment? Yes, of course. But it would operate like a bureaucratic system, favoring rules and procedures over comprehension. AI decides solely based on the rules that it is constantly learning. Hollywood has taught us that when AI gets us in trouble, it's because it has “decided” not to follow human instruction, but that is wrong. It's more complicated than that. The problems come about when AI makes its own rules by following our poorly written instructions and taking them too literally.

However, humans will still be involved in the decision making process. There are many business decisions that depend on more than just structured data—visions, company strategies, corporate values, the formation of and relationships between teams, and so on. This information will not be supplied to us by AI, and it is crucial for making good business decisions.

As Chief Algorithms Officer of Stitch Fix, Eric Colson, wrote in an article titled “What AI-Driven Decision Making Looks Like” for *The Harvard Business Review*, “AI may objectively determine the right inventory levels in order to maximize profits. However, in a competitive environment, your company may opt for higher inventory levels in order to provide a better customer experience, even at the expense of profits.”

Our involvement will not be eliminated, but it will evolve. We will not directly manage data anymore, rather we will manage the options selected by AI's processing of the data; similar to the way that we don't have to write a COBOL program anymore to organize our data—we simply click on a window that gives us access to a software program. When we are freed from managing data, we will have more time to focus on the things we can do that machines can't; such as managing values, strategies, feelings,

empathy, culture, and so on.

Let me give you a hypothetical example: every time we read in the news about an accident involving a self-driving car, we are told that it has happened because the AI got “confused.” This may be true, but the real question that we need to ask ourselves is, “Why did AI make a mistake?” The likely answer is that there was something that humans didn’t anticipate.

In 2016, there was a fatal accident when a truck drove out in front of a car using Tesla’s autopilot AI, which failed to brake. The AI of that car was designed for driving on the highway, but instead it was on city streets. The AI was perfectly able to recognize trucks on the highway seen from behind or in the rear window. However, trucks on a highway would never impact a car coming from its side. When the truck impacted its side, the AI simply didn’t recognize it. Was it AI’s fault? AI doesn’t care about feelings or nuances. Welcome to the dawn of algorithmic determinism.

If you want to hear my opinion, I think the release and the revision of the output should remain strictly under the control of humans. The rest can be managed by AI. This is similar to the way in which airplanes pilots only fly the aircraft for seven to eight minutes, while the rest of the time AI is controlling the plane.

### AI in a Nutshell

AI represents a vast field of research and innovation that aims to create intelligent systems capable of performing tasks that traditionally require human intelligence. These tasks include problem-solving, learning, reasoning, perception, and language comprehension. AI encompasses a wide range of techniques and technologies, all aimed at creating systems that can mimic or replicate human intelligence to varying degrees.

Machine learning lies at the heart of AI, focusing on algorithms and statistical models that allow computers to learn from data and make predictions or decisions without explicit program-

ming. This approach enables machines to recognize patterns, identify trends, and make informed choices based on the information provided.

One key area where AI has made a profound impact is in data analysis and insights. Deep Learning, a subset of Machine Learning, has gained significant attention in recent years due to its remarkable capabilities in processing vast amounts of data. Inspired by the structure and function of the human brain, Deep Learning utilizes artificial Neural Networks to simulate human-like decision making processes. These networks consist of interconnected nodes (functioning similar to neurons) that collectively process and analyze information to derive meaningful insights. AI-powered algorithms can process incomprehensible amounts of data quickly and accurately, uncovering valuable patterns, trends, and correlations that would be challenging for humans to identify. This enables businesses to make data-driven decisions, optimize operations, and gain a deeper understanding of customer preferences and behavior.

Customer experiences have also been greatly influenced by AI. Through chatbots and virtual assistants, AI enables personalized and responsive interactions with customers, providing round-the-clock support and tailored recommendations. Natural Language Processing (NLP) allows businesses to analyze customer sentiment, feedback, and social media data; helping to improve products, services, and overall customer satisfaction.

AI has also revolutionized various industries by automating repetitive and time-consuming tasks. Robotic Process Automation (RPA) and intelligent automation solutions can handle mundane, rule-based activities, freeing up Human Resources for more complex and strategic endeavors. In manufacturing, AI-powered robots and automation systems have streamlined production processes, increasing efficiency, reducing errors, and improving quality control.

Furthermore, AI has been instrumental in risk management and fraud detection. Machine Learning algorithms can an-

alyze vast datasets to identify anomalies and patterns indicative of fraudulent activities, preventing financial losses and protecting businesses and customers from potential threats. AI-powered predictive analytics also help businesses anticipate market trends, optimize pricing strategies, and improve demand forecasting.

Along with the benefits, AI adoption also presents challenges for businesses. Organizations must address ethical considerations—including privacy, security, and bias—to ensure responsible and fair AI usage. Furthermore, integrating AI into existing workflows and managing the impact on the workforce require strategic planning, re-skilling initiatives, and change management efforts.

### How Did We Get Here?

The field of Artificial Intelligence has experienced a remarkable evolution over the years, shaping the way we perceive and interact with technology. Initially conceived in the 1950s, AI has since undergone significant advancements driven by breakthroughs in computing power, algorithms, and data availability.

During its early years, AI focused on symbolic or rule-based reasoning, where machines were programmed with explicit guidelines to solve basic problems. This approach aimed to mimic human logic and decision making processes. However, it soon became clear that relying solely on rudimentary rules was insufficient for tackling complex real-world challenges.

The advent of Machine Learning in the 1980s marked a pivotal turning point in AI. Rather than relying on explicit programming, Machine Learning enabled computers to learn from data and improve their performance over time. This shift opened doors to more sophisticated techniques, such as Neural Networks, which simulate the interconnected structure of the human brain.

The late 1990s and early 2000s saw the emergence of practical applications for AI, with advancements in Natural Language Processing, Computer Vision, and speech recognition. These

breakthroughs paved the way for technologies we interact with daily, such as virtual assistants and image recognition systems.

More recently, Deep Learning has revolutionized the AI landscape. Enabled by the availability of massive amounts of data and advances in computational capabilities, Deep Learning has achieved remarkable success in areas such as image classification, speech synthesis, and language translation. Deep Neural Networks have proven to be highly effective at processing and understanding complex data patterns, propelling AI capabilities to new heights.

The evolution of AI has also been driven by the transformation of AI technologies into various industries. From healthcare and finance to transportation and manufacturing, organizations have recognized the transformative potential of AI and have started to incorporate it into their operations. This AI Transformation has led to significant advancements; including personalized medicine, fraud detection algorithms, autonomous vehicles, and smart manufacturing processes.

### Sometimes Even Humans Need an Upgrade

Artificial Intelligence has the potential to transform virtually every aspect of our lives; as it can provide us with new solutions to complex problems, increase productivity and efficiency, and unlock new opportunities for growth and innovation. According to a report by McKinsey & Company, AI is expected to contribute up to \$15.7 trillion to the global economy by 2030, making it the most important emerging technology over the next decade.

However, the increasing prevalence of AI also raises concerns about its impact on individuals and society as a whole. As Elon Musk warned, “If you create a superhuman intelligence, that AI will be better than humans at creating AIs. So it will create an AI that’s even smarter than itself. And that AI will create another AI, and so on. This recursive improvement could continue until we reach a point where AI vastly surpasses human intelligence,

and it becomes impossible for us to control or understand it.” Indeed, the potential risks of AI include job displacement, loss of privacy, and even existential threats to humanity.

While these concerns are understandable, it is important to acknowledge that they are often exaggerated and not entirely justified. In fact, many organizations and individuals are working hard to develop AI in an ethical and responsible manner. One example is the Partnership on AI, a collaboration between tech giants like Amazon, Google, IBM, and Microsoft, as well as non-profit organizations and academic institutions. The Partnership aims to advance public understanding of AI, develop best practices, and promote responsible development of AI technologies. As Eric Horvitz, Director of Microsoft Research and Co-chair of the Partnership on AI, explained, “The Partnership on AI is committed to advancing and promoting responsible AI development. We believe that AI can have a tremendous positive impact on society, but we must ensure that its development and deployment aligns with our values and ethical principles.”

Similarly, many governments around the world are taking steps to regulate AI development and use. In the European Union, for example, the European Commission recently proposed new regulations on AI, which include requirements for transparency, accountability, and human oversight. As Margrethe Vestager, Executive Vice President of the European Commission, stated, “We want to promote the use of AI, but in a way that is human-centric and that respects our fundamental values.”

Case studies also demonstrate the potential benefits of AI when developed and utilized in an ethical and responsible manner. For example, AI-powered medical devices can improve diagnostic accuracy and help doctors provide more personalized treatment to patients. AI algorithms can also optimize energy consumption and reduce greenhouse gas emissions, addressing the urgent need to tackle climate change.

AI is set to become the most important emerging technology over the next decade. While concerns about the impact of

AI on individuals and society are understandable, it is important to recognize that they are often exaggerated and not entirely justified. Through lawmaking and corporate initiatives, as well as ethical and responsible development of AI, we can ensure that the potential benefits of AI are realized while minimizing the risks. As Satya Nadella, CEO of Microsoft, stated, “AI is one of the most transformative technologies of our time, and we have a responsibility to ensure that it benefits everyone.”

### Honey, Will I Shrink My Brain?

Can excessive reliance on AI weaken certain biological functions of the brain?

We all know that when the body has no further biological need to maintain an organ’s function, the cellular reproductive system atrophies it. While it is natural for certain biological functions to atrophy when they are no longer necessary for survival, the impact of constant AI use of the brain’s biological functions remains a topic of debate. As Stuart Russell, Professor of Computer Science at the University of California, Berkeley, wrote in the *MIT Technology Review*, “There are concerns that as we increase our reliance on AI and automation, we may lose some of our cognitive capabilities and critical thinking skills. It’s important to find the right balance between human intelligence and AI to ensure we don’t become overly dependent on technology.”

Excessive reliance on AI can potentially lead to a sense of complacency. When AI systems consistently provide accurate and efficient results, individuals may become overly dependent, neglecting the need to exercise their own cognitive abilities. This dependency can weaken the brain’s capacity to perform certain tasks, as it becomes accustomed to outsourcing those functions to AI technologies.

The relationship between AI usage and the human brain is complex, and neuroscientists will need further research to fully understand its effects. Yet historical examples demonstrate how

the constant use of certain technologies has weakened specific parts of the human body.

In ancient times, reliance on writing to record and store information weakened human memory capabilities. The need to memorize vast amounts of knowledge diminished as writing became a more prevalent means of information retention. This shift led to a decline in the ability to recall information without external aids, as the brain's memory functions atrophied due to reduced usage. On the other hand, writing has also enhanced our ability to preserve and transmit knowledge across generations, leading to significant advancements in human civilization.

The introduction of calculation tools has changed the way we perform mathematical computations. Calculators have reduced the reliance on mental arithmetic and manual calculations. With the introduction of these computing devices, mental arithmetic skills have significantly declined over the years. As a result, the brain's ability to perform calculations without external aids has weakened. This trend highlights how the constant use of calculation tools can diminish specific cognitive functions of the brain.

In previous centuries, walking was integral to transportation. With the convenience of automobiles and other modes of transportation, physical activity levels have decreased, leading to reduced physical fitness and overall health. This decline in physical fitness can be attributed, in part, to the constant use of cars.

Regular exercise, mental stimulation, and social interactions play vital roles in preserving brain health. Additionally, engaging in activities that foster critical thinking, problem-solving, and creativity can help mitigate any potential negative effects that may arise from excessive reliance on AI. What are the potential implications of AI on our cognitive abilities? These are my three main concerns:

1. Reduced memory capacity:

AI-enabled devices, such as smartphones and virtual assistants, store vast amounts of information that can be readily

accessed. This might lead to a decline in our memory capacity. Outsourcing memory storage to external devices, our brains may gradually lose their ability to retain and recall information effectively.

## 2. Decreased analytical thinking:

Relying heavily on AI systems for data analysis and decision making may diminish our own cognitive abilities in terms of analytical thinking and problem-solving. Over time, our reliance on AI algorithms to handle complex tasks might lead to a decrease in our ability to independently analyze and interpret information.

## 3. Impaired social skills:

The growing use of AI-driven communication platforms and virtual assistants might hinder our social interactions and communication skills. Depending on AI systems for social interactions could reduce our ability to empathize, understand subtle cues, and engage in meaningful human connections.

Maintaining a healthy brain requires a combination of factors; including mental stimulation, regular exercise, social interaction, and a balanced lifestyle. Integrating AI into our lives should be approached mindfully, ensuring that it complements and enhances our cognitive abilities without replacing or weakening them. Dr. Susan Schneider, a philosopher and cognitive scientist, stated in a *Forbes* interview, "While AI has the potential to augment our cognitive abilities and provide valuable tools, we should be mindful of the potential risks. It's essential to ensure that AI systems are designed in a way that respects human agency and promotes human flourishing rather than compromising our cognitive autonomy."

AI systems will offload routine tasks allowing us to focus on higher-order thinking, creativity, and complex problem-solving. AI technologies can streamline information retrieval, giving us access to vast amounts of knowledge instantly. This increased

efficiency in information processing will facilitate faster learning, broader knowledge acquisition, and improved cognitive performance.

The development of neurotechnology, such as Brain-Computer Interfaces (BCIs), holds promise for enhancing brain functions rather than weakening them. BCIs can enable direct communication between the brain and external devices, potentially empowering individuals with enhanced cognitive abilities and expanding our cognitive capacities.

### Friend or Foe? Separating Fact from Fiction.

Warren Buffett, one of the world's foremost financiers, is sounding the alarm on Artificial Intelligence. Paraphrasing Albert Einstein's famous quote about the atomic bomb, he stated that, "with AI, it can change everything in the world, except how men think and behave, and that's a big step to take." Buffett added that he's concerned about the seemingly endless things AI can or could soon be able to do. "It can do all kinds of things," he said. "And when something can do all kinds of things, I get a little bit worried."

Is it AI friend or foe? As AI becomes increasingly prevalent, many people remain fearful of its impact. These fears are often based on a lack of understanding of the technology, as well as media portrayals of AI as a threat to humanity. Elon Musk, CEO of Tesla and SpaceX, said in a speech for the MIT Aeronautics and Astronautics Department's Centennial Symposium, "With Artificial Intelligence, we are summoning the demon. In all those stories where there's the guy with the pentagram and the holy water, it's like, yeah, he's sure he can control the demon. Didn't work out."

On the other hand, Sundar Pichai, CEO of Google, noted in an op-ed for *The Financial Times*: "We must be clear-eyed about the risks of AI, but there is no doubt in my mind that it will have a profound impact on the world, unlocking new possibili-

ties and opportunities for people everywhere.” One of the primary fears surrounding AI is that it will lead to job loss and widespread unemployment. This fear is not entirely unjustified, as AI is already being used to automate many jobs previously performed by humans. However, history has shown that technological advancements often create new jobs and opportunities. For example, the advent of the internet created entirely new industries and job markets, from social media managers to e-commerce specialists. Similarly, the development of AI is likely to create new opportunities for individuals with the skills to work with and develop the technology.

Another common fear is that AI will make decisions and take actions on its own, leading to unintended consequences and potentially dangerous outcomes. This fear is rooted in the fact that AI algorithms are often opaque and difficult to interpret, making it difficult to understand how they arrive at their conclusions. However, there are many efforts underway to make AI more transparent and understandable. For example, some researchers are developing “Explainable AI” (XAI) systems that are designed to provide more insight into how AI algorithms make decisions.

The portrayal of AI in popular media also contributes to fear and mistrust. Hollywood movies often depict AI as a threat to humanity, with machines rebelling against their human creators and causing widespread destruction. While these portrayals may be entertaining, they are not an accurate representation of the current state of AI development. As Peter Norvig, Director of Research at Google, notes in an article for *Forbes*, “AI is not going to wake up one day and decide to destroy humanity. It is a tool that we can use to make the world a better place.”

There are also concerns about the potential misuse of AI, such as using it to develop autonomous weapons or mass surveillance. While these concerns are valid, there are many efforts underway to ensure that AI is developed and deployed in an ethical and responsible manner. For example, in April 2021, the EU proposed new regulations for AI that aim to protect individual rights

and ensure that the technology is used in a safe and ethical manner.

There are legitimate concerns surrounding AI, but many of the fears are based on a lack of understanding and exaggerated portrayals in the media. As AI continues to evolve and become more prevalent, it is important for individuals, companies, and governments to work together to ensure that the technology is developed and used in a responsible and ethical manner.

### A Brave New World

Before the Industrial Revolution, everything was achieved by muscle. Whether human or animal, physical strength and exertion were the only ways to get anything done. Everything changed when the first and second Industrial Revolutions were fueled by artificial power. We began using steam and fossil fuels as sources of power, followed by oil and electricity. A John Deere tractor took the place of the farmer and steam trains brought goods to market instead of horses. Then artificial power became a distributed utility as we started to store and disburse through wires and pipes, as we had done in the past with water.

The next revolution will be generated by Artificial Intelligence. And we will do the same thing—history always repeats itself—by storing the AI on a cloud and distributing it through a grid. Distributed AI will be the new utility and it will flow across the grid in the same way that electricity, gas, and water do. I estimate that the global market size of AI-driven business will hit \$10 trillion by 2030, while giving birth to a myriad of powerful new companies in the healthcare, retail, finance, transportation, logistics, automotive, information and communications technology (ICT), energy, and manufacturing industries.

AI is the new user interface, the link that allows the interaction between man and machine. We have seen digital User Interfaces (UIs) evolving over time, and increasingly resembling accurate human behavior. First, they involved writing words and numbers, then clicking icons and links, followed by touching

screens. Now we talk to chatbots such as ChatGPT and conversational computers such as Siri. In the future, our actions will be indexed by intelligent devices, for the purpose of learning how to adapt their behaviors to our wishes. AI will forever change the way we interact with technological systems.

Consumers will increasingly demand AI-driven technologies to improve their products and services, simplify their daily routines, save them time and money, and better their quality of life—and all in a faster and cheaper way than before. As Machine Learning technology improves, Artificial Intelligence is becoming mainstream. Nearly one hundred years ago, Republicans supporting Herbert Hoover promised Americans “a chicken in every pot and a car in every garage.” Fifty years later, Bill Gates launched Microsoft with the declaration of “a computer on every desk, and in every home.” Tomorrow’s new promise should be “AI power in every object”.

Not that long ago, business decisions were supported by so-called “knowledge management,” and companies invested considerable amounts of money in it. Then we evolved to use search management, as online search engines helped us to find (almost) every bit of knowledge and information we needed. Finally, we have moved to data management.

Embracing AI will provide us with improved processing of structured data. Evolving from data-driven to AI-driven decision making will be the next phase in our evolution. It will be a cultural revolution, and the companies that can sufficiently adapt to the change will survive at higher rate. We have already seen this play out with the internet and digital technologies—the more conservative companies will struggle to embrace AI, while the more progressive, AI-native companies will surge and take over. Welcome to the AI Transformation age.

Doing What Hasn't Been Done—Yet

In a 1951 paper—five years before John McCarthy coined

the term “Artificial Intelligence”—British mathematician and computer scientist, Alan Turing. proposed a test, that he described as “The Imitation Game,” although it’s usually referred to as the “Turing Test.” Ever since, passing the Turing Test has been the goal in the development of Artificial Intelligence.

This is how the Turing Test works: The test is administered by one person, to another person and a machine. The tester will be separated and will carry on a chat conversation with both the person and the machine. The tester is allowed to ask questions of the person and the machine—not knowing which they are addressing, of course—such as, “Will you please tell me whether you play chess?” The goal is for the tester to determine, based on the quality of the conversation with each of them, which responses are coming from the person, and which are coming from the machine. Or seen from the machine’s point of view, the goal is to convince the tester that they are the other human, and not a machine.

About this game, Turing said, “I believe that in about fifty years’ time it will be possible to program computers to make them play The Imitation Game so well that an average tester will not have more than a 70 percent chance of making the right identification after five minutes of questioning.” In order to pass the Turing Test, a computer needs to be able to carry on a conversation. Yet seventy years have come and gone and a chatbot like Siri would certainly not pass the test, as it only works on queries (asking questions), which it only does with varied rates of success. The IBM supercomputer Watson could be quite convincing in giving short factual answers, but it’s not conversational.

We haven’t had a real breakthrough in AI since the Turing Test in the 1950s. Yes, I know. It seems like there are several breakthroughs every year—or at least that’s what the marketing departments of the AI companies tell us. But were they really “breakthroughs,” or have we just been successful because we have access to more processing power?

Speaking of marketing definitions, remember that when marketers assign names to new products, they don’t know what

that product will become. Take the word “computer” for example. It comes from the verb “to compute,” or literally “to make arithmetical calculations.” Today, we all know that a computer will not just make arithmetical calculations—otherwise we would call it a calculator. The neologism “computer” was created at the beginning of the last century by Charles Babbage—an English mechanical engineer who was too shortsighted to foresee the world-changing machine that the computer would eventually become. Fifty years later, the computer scientist John McCarthy, coined the term Artificial Intelligence—a great term to use for marketing, but a semantical crime. Sixty years have come and gone since then, and still nobody can really define what Artificial Intelligence means. It’s a moving target.

Artificial Intelligence refers to any system programmed to make autonomous decisions. Decisions that, in the past, required human intelligence such as critical thinking, language comprehension, and environmental perception. The so-called “Tesler’s Theorem” states, “Artificial Intelligence is whatever machines haven’t done yet.” Over the years, what we have considered to be Artificial Intelligence has included chess-player software like Deep Blue, toys like the Furby, and vacuum cleaners like the Roomba—together with many other forgotten products and applications. Yet none of these would be considered AI anymore. In fact, if you search Alexa, Siri, or Cortana you will find that most authoritative sources no longer consider them AI either. Why? The answer comes from John McCarthy himself. Yes, the same guy who originally coined the phrase. A few years later he had to admit that, “As soon as it works, no one calls it Artificial Intelligence anymore.” Long story short, the AI of today is the everyday software of tomorrow. Say goodbye to the term AI. As far as I see it, Artificial Intelligence does not actually exist—it’s just more computing power.

So let me give you a more technical definition of AI, based not around conversational ability, but around decision making. First of all, we must point out that there are two kinds of AI—narrow and general. Artificial Narrow Intelligence (ANI) systems

are everywhere. We do not even notice them. Their decisions are based on narrow parameters such as, “Is this word spelled correctly?” or “Is this password being used by an authorized person?” or “How can the search query you are entering into Google’s search box be autocompleted?”

Things get more complicated with Artificial General Intelligence (AGI) systems, which are required to make decisions based on extremely broad parameters. “How much broader?” you may ask. The truth is: nobody knows. There are not fixed parameters, but rather they are ever-changing, as what we considered broad yesterday is now considered narrow. Since the seventy-year-old Turing Test, various alternative criteria have been proposed, but there is still no widely accepted definition.

Curious to hear some examples? Here they are. “The Coffee Test” was proposed by Apple’s cofounder, Steve “Woz” Wozniak. In this test, a machine is required to enter an average American home and figure out how to make coffee. This includes finding the coffee, finding the coffee machine, adding the water, brewing the coffee by pushing the proper buttons, and finding a mug to pour it into. Another is “The Robot College Student Test” which was suggested by AI scientist, Ben Goertzel. For his test, a machine must enroll in a university, take (and pass) current curriculum, and obtain a degree. Similarly, “The Employment Test” proposed by Nils John Nilsson, one of the founding researchers in AI, requires that a machine work an economically significant job and perform at least as well as humans in the same job.

The way I see it is that, nowadays, we cannot consider any future system AGI if it doesn’t have something to do with Deep Learning. What is Deep Learning? It’s the evolution of Machine Learning. It is a system trained to learn on its own; able to automate tasks typically done by humans, such as writing software. Which means that AGI systems should hypothetically be able to write themselves. Does it mean that we will become unemployed? I don’t think so. Let me tell you why.

## Gulliver, The Engine, and ChatGPT

The first step in any invention is the idea. For the first mentions of AI, I think that we should look back to 1726—when Jonathan Swift published a mocking description of a machine that would automatically write books on the arts and sciences. The machine was *The Engine*; the book was *Gulliver’s Travels*.

You know the story... On the fifth night of sailing in his canoe, Gulliver lands in the continent of Balnibarbi. In the morning he notices that what he thought was a cloud floating above the area is actually a floating island. Gulliver calls up to the people he sees moving about the island and they lower down a system of pulleys that can lift Gulliver up. Gulliver learns that he is on Laputa.

The people there have terribly short attention spans, so they carry around “flappers” to hit other people during conversation in order to keep them focused. The Balnibarbi people live in poverty because they spend all public funds to finance their famous “Grand Academy of Lagado,” aka the Academy of Projectors—or “futurists” as we would say today. In the Academy a number of ridiculous projects are being carried out.

While in the Academy, Gulliver meets with a Professor of speculative learning, who is engaged in a number of literary projects. He says, “We crossed a walk to the other part of the Academy, where, as I have already said, the projectors in speculative learning resided. The first Professor I saw was in a very large room... he said, ‘Perhaps I might wonder to see him employed in a project for improving speculative knowledge by practical and mechanical operations.’”

In one of these projects the Professor has a team of students turning handles on a complicated mechanical frame that generates random strings of words, with the goal to find “three or four words together that might make part of a sentence.” It sounds like “keywords” doesn’t it? Let’s keep going. “They read them out and they are recorded by a team of scribes. The small phrases

created by this mechanism are being collected into a Folio that the Professor believes will give the world a compleat Body of all Arts and Sciences.”

Then the Professor explains to Gulliver that “the most ignorant person at a reasonable charge, and with a little bodily labour, may write books in philosophy, poetry, politics, law, mathematics and theology, without the least assistance from genius or study.”

Wow, that’s definitively ChatGPT, isn’t it?

Although Swift’s *The Engine* was intended as a satirical invention, it was an early example of the human desire to imitate intelligence—a desire that has been around for a really long time.

Two hundred years after *Gulliver*, two biophysicists named Warren S. McCulloch and Walter Pitts described networks of simplified artificial “neurons” and how they might perform simple logical functions such as “mimicking the brain.” It was the inspiration for “Neural Networks” and “Deep Learning”.

Artificial Intelligence mimics our brain, so what? All the tools before it had mimicked parts of our body or parts of animals’ bodies. A tool is a body extension by default. It’s usually more powerful, more efficient, and most of all, under our control. Let’s acknowledge the elephant in the room: we are not against Artificial Intelligence; we are scared to death to lose control.

### The Paradox of Automation: Automation Creates Occupation

Now that we’ve discussed the dangers of the blind and unquestioning application of new technologies, let’s look at its opposite: the bias against progress and change, and the belief that new technologies will lead to catastrophe. One of the most common fears is that unemployment will result from technological advancement. For example, the current number of industrial robots in use is still rather low, comparatively speaking, but potentially 60 percent of future manufacturing jobs will be done by automa-

tion. This prediction causes widespread fear of unemployment, which in turn prevents lawmakers from supporting these advancements. This leads us to my work on the “Paradox of Automation,” a theory that I recently presented in a speech at the Davos World Economic Forum.

The World Economic Forum has recently stated that over 5 million jobs could be lost in the fifteen leading global economies over the next five years. It’s a common belief that automation will kill occupation. Here is a quote from an expert on the future of work, Thomas Frey.

“By 2030, more than 2 billion jobs will disappear, roughly 50 percent of all the jobs on the planet. Here are a few examples of how this will occur. Driverless cars will be on the verge of eliminating millions of driver positions. Buses, taxis, trucks, limos, UPS, FedEx, and more will be transitioning into driverless forms of themselves. At the same time, we’ll see a dwindling of parking lots, gas stations, traffic cops, and traffic courts, and fewer doctors and nurses will be needed to treat injuries. Education will see a mass transition from teaching to coaching, as 90 percent of all traditional classes will take place online by 2030, even in K-12. ‘AI will teach kids how to read,’ as stated by Bill Gates. And 3D printers will disrupt everything from manufacturing, to health care, to retail, to art, to construction and building materials. Printed clothing and shoes produced at the store you’re shopping in will replace garment districts around the world. Printed buildings and houses will eliminate the need for contractors and building materials. Pill printers will replace entire pharmacies. Automated manufacturing is already eliminating tons of jobs. Bots and drones will begin disrupting many other industries along with their base of employment.”

What Frey wrote is true—it’s all going to happen. Yet I believe that automation will actually create occupation. It’s what I named the Paradox of Automation. Allow me to first set the stage to explain how this paradox works.

It is as true now, as it was in the past, that technology

causes many jobs to become obsolete. Almost two hundred years ago, textile workers in England destroyed the first industrial machines in protest against employers who used those inventions to replace them. Those with routine job responsibilities will always lose their jobs when advancements in automation arise. What is new, however, is that for the first time this will impact both blue- and white-collar workers, because many white-collar jobs are also becoming routine and replaceable. We can see this when we look to Wall Street, Silicon Valley, and just about anywhere else—and it is due to the rise in AI software.

The combination of robotics and AI will be disruptive. A study from Forrester Research predicts that in the US, 25 million jobs will disappear over the next ten years - three times as many jobs as were lost in the 2008 financial crisis. An Oxford University study on the future of work concluded that almost one out of every two current jobs—47 percent to be precise—will eventually be automated by machines.

The example of the self-driving car is the easiest one for us to grasp. We are all looking forward to having one—it sounds cool, right? But did you know that “driver” is actually the most common job in over half of all the states in America? With self-driving cars, many commercial drivers will become unemployed in the medium to long-term. Goldman Sachs expects self-driving vehicles to cause 25,000 truckers to lose their jobs each month in the coming years. Yet as dire as all of these job loss predictions are, the fear they generate is misplaced. And we will see why as we take a look at history.

In 1878, there were 40 million people employed on farms in the US. Then came along the tractor and the automation of agriculture. During the Industrial Revolution in the early 1800’s, when steam engines were first applied to moving vehicles, their largest use was for farming equipment—mostly for tractors. One hundred years later, there are only 2 million farmers remaining in America. In spite of a 95 percent reduction in farm employment, American farmers are still feeding a nation of 320 million—and

there is no shortage of food. Why? Are we eating less? I don't think so. Automation simply eliminated farm jobs. It created a massive unemployment—38 million people forced out of a job. That's a considerable number.

The same thing happened with the advent of electricity. During the Industrial Revolution most jobs moved to factories. Then along came computers and the Digital Revolution. From 1950 to 2010, the number of Americans factory employees fell by 75 percent. Once again, automation caused significant unemployment. Most of the great inventions of the last two hundred years were purposely designed to replace human labor; from tractors on the farms, to assembly lines in factories, to computers in the service industry. Currently, most workers are in the service sector, and it's going to happen again—robotics and Artificial Intelligence will cause another mass job extinction. But the question is this: Is it an extinction or an evolution?

The assembly line dramatically increased production as it improved the process of manufacturing automobiles. Over a six-year period, the number of Model Ts annually produced per worker nearly tripled, from eight to twenty-one. This surge in productivity, combined with increasing economies of scale, enabled Ford to reduce the price of the car from \$950 in 1909 to \$440 in 1915. As a result, in that same time frame, the number of cars sold increased thirty-fold, and employment at the Ford factories rose from 1,655 workers to 18,892.

Recent research on both the number and types of jobs lost to emerging technologies and the number of new jobs created by those technologies reveals a pattern. Some work activities decline, sometimes rapidly. Yet as new types of work activities are also created, the net impact of emerging technologies is highly positive—creating new jobs that far exceed the previous employment. This is the Paradox of Automation. Automation means more work in less time. Employment goes down, but prices go down as well. In response to lower prices, demand increases, and employment goes up. We see the same trend with computers as well. While

computers now perform the jobs that have replaced 3.5 million workers, they have also created over 19 million new jobs. The same thing has happened every time a technological innovation has jeopardized occupation. Let me put this in perspective with the help of some data.

The rise of personal computers led to the decline of industries such as typewriting and paper-based record keeping, resulting in the loss of many clerical and administrative jobs. However, it also created millions of new jobs in areas such as software development, IT support, and data analysis. According to a study by the Information Technology and Innovation Foundation (ITIF), the computer and information technology sector created over 15 million jobs in the United States between 1980 and 2015, while eliminating around 7.5 million jobs in other sectors. The growth of online shopping in recent years has created new jobs in areas such as e-commerce, digital marketing, and logistics. It has also led to the decline of traditional brick-and-mortar retailers, resulting in the loss of many retail jobs. According to a report by the National Retail Federation, the retail industry created around 2.6 million new jobs in the United States between 2009 and 2017, while eliminating around 680,000 jobs in traditional retail stores. The shift towards renewable energy sources such as solar and wind power has led to the decline of jobs in the fossil fuel industry, particularly in coal mining and oil drilling. It created new jobs in areas such as manufacturing, installation, and maintenance of renewable energy systems. According to a 2019 report by the International Renewable Energy Agency (IRENA), the renewable energy sector created around 11 million jobs globally in 2018, while the oil and gas industry employed around 5.3 million people globally in 2017.

Remember the statistic that I mentioned above that stated 47 percent of current jobs would be eliminated by new technology over the next ten years? That's 400 million jobs lost. However, the flip side of that are the 965 million jobs that will be created by the new technology. That's an increase of 565 million new jobs. And that is precisely that Paradox of Automation. Automation does in

fact create occupation!

As AI scales up, it will be more efficient to have all repetitive work done by autonomous robots instead of humans. People will then have more time to focus on tasks requiring deep thinking, decision making, and emotional intelligence. Human input will be needed whenever situational knowledge and context are required, as well as for a final check and validation of Machine Learning assumptions.

In the short-term, automation will fill the labor shortage in labor-heavy industries such as manufacturing and agriculture. In the long-term, automation will replace humans in all dangerous jobs, and ultimately will increase the quality of human work, with fewer—yet better paid—working hours. Just think of how drones could help avoid fatalities on construction sites, by flying over dangerous locations such as mountains or bridges, to allow workers to inspect from a safer vantage point. Long story short, I foresee robots taking on the work that we often don't want to do, allowing us to improve our working conditions.

An assumption behind the fear of AI and robots is that the number and types of jobs available to humans remains fixed, so robots and AI will take those jobs away from humans. Because of this assumption, we do not plan for change. However, the reality is that as technology advances, the number of jobs will increase in size and change in nature, generating new types of jobs and in greater numbers.

The emerging technologies will significantly change the way we work and will inspire new business ideas; and these ideas will convert into new jobs that don't exist yet.

### Fear Not AI, For It's Just More Processing Power

John McCarthy, a computer scientist, and one of the founders of the field of AI once said, "Intelligence is the computational part of the ability to achieve goals in the world." I cannot agree more. Artificial Intelligence has been a buzzword for quite

some time now, but it's not a new technology. AI is processing power on steroids. Processing power has been around for many decades, but in recent years AI has become more mainstream, and its applications are increasing rapidly.

Let me be clear about it: AI is not a new technology; rather it's new applications using more processing power to do what we already did. There is one simple reason why we need AI: since the world went digital, we need machines that can process vast amounts of data quickly and accurately. We need more processing power; without it we would not be able to do what we have grown accustomed to—and sometimes dependent on.

For example, companies like Uber and Lyft use AI to optimize their ride-hailing services; the AI algorithms help to match drivers with passengers, minimize wait times, and calculate fares based on distance and time. Without AI, such services would be impossible to provide at the scale they do. Similarly, dating apps like Tinder and Bumble use AI algorithms to match users based on their preferences and behavior. The algorithms learn from users' actions—such as swiping left or right—and use that data to suggest potential matches. This not only saves time but also increases the likelihood of finding compatible partners. Are you ready to renounce all these services? I don't think so. Yet the best is still to come.

The performance of AI is enabled by high-speed networks and digitalization. The more connections we have, and the more digitalized our world becomes, the better AI will perform. For example, autonomous vehicles rely on a combination of sensors, cameras, and Machine Learning algorithms to navigate safely on the roads. Over the next few years, the autonomous vehicles will become more common, and they will generate massive amounts of data that need to be processed in real-time, which is only possible with high-speed networks.

The adoption of AI is being accelerated by emerging technologies like the Internet of Things (IoT), 3D Printing, Experience Reality (aka mixed reality), and Cobots (cooperative robots). That's

why this book is not limited to AI, there is no AI Transformation without integration with these emerging technologies. The AI Transformation is an ecosystem, we will get back to this concept later. In the meantime, let me tell you the secrets of a magical forest.

### The AI Magical Forest: A Fairy Tale from the Future

Imagine you're entering a magical forest where different creatures live. In this forest, you come across a group of animals, each with unique abilities. These animals represent different aspects of the Artificial Intelligence ecosystem, along with the wondrous integration of emerging technologies.

As you wander deeper into the forest, you come across a smart squirrel and a clever fox. The squirrel represents the techniques used in AI, as it harnesses its keen senses to sense and perceive the world. Just like a squirrel uses its keen senses to find and store nuts, AI techniques enable machines to sense and perceive the world around them. For example, cars can now use sensors to detect their surroundings and park themselves without human intervention. The fox symbolizes the Internet of Things, connecting different objects and devices to the digital realm. Together, they work harmoniously to gather data from the forest and make informed decisions based on the information they acquire. For instance, IoT sensors placed in the forest can collect real-time data on weather conditions, animal behaviors, and plant growth; which can then be analyzed by AI algorithms.

Continuing your journey, you encounter a wise owl and an industrious beaver. The owl embodies the models in the AI Ecosystem. Similar to how an owl's intelligence allows it to reason and make informed decisions, AI models use data and algorithms to analyze information and make predictions. For instance, emerging platforms are now capable of having seemingly natural conversations with humans, like virtual assistants that understand and respond to our questions. The beaver represents 3D Printing, tirelessly constructing intricate structures with precision and ef-

iciency. The combination of AI models and 3D Printing allows for the creation of advanced prototypes with unparalleled speed and accuracy. For example, AI algorithms can optimize designs, while 3D printers bring them to life by fabricating physical objects based on those designs.

As you continue deeper into the forest, you encounter a group of adaptable chameleons. These chameleons represent the frameworks of AI. Just as chameleons change their colors to adapt to their environment, AI frameworks provide a flexible structure for machines to adapt and learn from new experiences. This adaptability enables AI to continuously improve and perform tasks more efficiently over time.

Further along the path, you stumble upon a cooperative group of animals; including ants, birds, and monkeys. These animals symbolize cooperative robots, working together seamlessly to achieve common goals. Just as ants collaborate to build complex colonies, birds flock together in perfect synchronization, and monkeys share tasks to gather food, cooperative robots operate in unison to accomplish complex tasks that surpass the capabilities of individual machines. AI algorithms enable these robots to communicate, coordinate, and adapt their actions; leading to remarkable achievements in fields such as manufacturing, logistics, and healthcare.

But the magic of the forest doesn't stop there. As you reach the heart of the forest, you discover a legendary creature called the AI Dragon. This legendary creature represents the evolution of AI intertwined with mixed reality. The AI Dragon possesses extraordinary powers, thanks to its integration with technologies like Experience Reality. By merging the digital and physical worlds, Experience Reality allows humans to interact with AI systems in more immersive and natural ways. For example, humans can visualize and manipulate virtual objects in real-world environments or receive AI-generated information overlaid on their surroundings.

Together, these creatures form a harmonious ecosystem that combines AI with emerging technologies like IoT, 3D Print-

ing, cooperative robots, and Experience Reality. This integration unlocks incredible possibilities; enabling machines to sense, reason, act, and adapt in ways that were once unimaginable. As you explore this enchanting forest, you witness firsthand the transformative potential of these technologies working together to shape our world in extraordinary ways.



# THE AI EVOLUTION

## The Roaring Twenties, Revisited

The year was 1920. The First World War had come to an end, and a tenuous peace had been established. Soldiers and civilians alike were eager to forget the hardships they had endured, to move forward, and to simply enjoy life once again. People everywhere were excited to experience the new technologies that were suddenly materializing around them: silent motion pictures, technicolor movies, jukeboxes, cars, and so much more. Popular culture encouraged people to indulge in the new, in every aspect of their lives. They adopted increasingly emancipated moral standards, and new music and fashions along with them—jazz tunes, upbeat dancing, shorter hemlines, and bare arms. It was also a time of great progress in science and medicine, with life expectancies increasing due to the invention of drugs such as penicillin and insulin. People were eager to put the war behind them, and they were exuberant as the waves of change came crashing in. It was the “Roaring Twenties.”

It was a time, not only of great societal change, but of great economic change as well. The period was characterized by exceptional prosperity—a surging economy and a booming stock market. People were hopeful and confident. In hindsight, perhaps they were overconfident. Pushed by an ever-increasing number of mass advertisements in the newspapers and on the radio, people began compulsively buying new products. Consumption replaced austerity. The twenties marked a shift in lives and habits; in business and economy. And the increased demand for new products resulted in the overproduction of goods and ultimately the rise of consumerism.

All of this was made possible with the rise of an emerging technology: electricity. Electricity enabled the adoption of assembly lines. The resulting automation provided the means for mass

manufacturing, which triggered the invention of a myriad of new products. These products could be bought easily with credit, which companies began extending with such frequency that up to 90 percent of some goods were bought on installment plans. Homes began to fill up with objects like refrigerators, dishwashers, radios, phonographs, televisions, electric razors, irons, toasters, vacuum cleaners, and instant cameras. Eventually even garage doors with remote openers so that people could easily store their new cars, courtesy of Henry Ford. It was the era of modernism, brimming with possibilities, new ideas, and inventions—and irrational exuberance.

As it was, so it will be again. History will repeat itself. Welcome to the “New Roaring Twenties.” As our society emerges from the battle it has so bravely fought against the Coronavirus, people are anxious to put the times of hardship and suffering behind them and are eager to find new ways to simply enjoy life once more. We are finding ways to make our lives more gratifying by using new technologies. Experience Reality, IoT Smart Objects, self-driving cars, and countless other inventions are beginning to change the way we live our lives.

We are starting to be compelled, finally, to fully embrace the true millennial culture, with its new modes of living and working, and with its more conscious environmental standards. It will be a time of great advancement in technology, science, and medicine. After we move past the post-pandemic recession, we will come into a period of economic prosperity—although it will take a few years to accomplish a full recovery. Even the Roaring Twenties did not begin precisely on January 1, 1920. History is not that neat and tidy. In reality, that economic boom occurred from 1923 to 1929. Similarly, the economic rebound in our own decade is also taking some time.

The New Roaring Twenties will also mark a shift in lives and habits; in business and economy. And like its counterpart a century before, it will start with the rise of an emerging technology—this time, Artificial Intelligence. This new technology will

trigger the invention of a myriad of new connected smart objects. And our homes will begin to fill with objects such as connected robots, holograms, self-driving cars, delivery drones, smart dust, 3D home printers, augmented eye-lenses, connected jewels, and thousands of AI-driven startups.

We have stepped onto a roller coaster that is ready to take off into a roaring decade of modernism—one filled with fresh ideas, new inventions, and irrational exuberance. Yet we are totally unconscious of the business dangers of this dramatic shift we are facing. As a consequence, many existing companies may face financial ruin. It already happened before, and it will happen again.

Remember that much like today, the Roaring Twenties were also characterized by high inequality in the distribution of wealth, a rise in organized crime, an increase in xenophobia and far-right extremism. And that eventually the high spirits and hope of the twenties gave way to the Great Depression—a trend we may also see in our own time. Change comes fast, and those who are not careful to avoid getting swept along by it, find themselves moving in a direction they do not want.

Think about how dramatically the world changed between 1983 and 2000. I'll cite just one figure: almost half of the Fortune 500 companies in the year 1983 no longer existed by the year 2000. I don't mean they disappeared from the list. They disappeared altogether. They failed completely or were purchased and merged into other companies. They had underestimated the changes generated by the World Wide Web and as a result, they did not survive.

Another great change is coming. The stage is being set and we would be wise to use this brief intermission to get ready for the shift. The lockdown forced upon us by this pandemic has paused markets, productivity, and economy. We are forced to stop and reflect. So why not use this momentary lull to absorb the change to come, to elaborate new strategies, to learn and grow, and to train our organizations to use the technological transformation as it unfolds.

Our first step should be to familiarize ourselves with AI and the emerging technologies that will trigger the shift—to understand their potential and how we can leverage them to gain a competitive advantage.

I believe that within a few years we will move assertively out of the recession, and guided by emerging technology, usher in a new business renaissance. It will be a brave new world driven by Artificial Intelligence and filled with such things as dreams are made of—Experience Reality, IoT smart objects and wearables, conversational and manufacturing robots, autonomous vehicles, and more. What is driving this big change is Artificial Intelligence. How will we get there? It all started with the Digital Transformation and Big Data.

### Digitalization: A Journey, Not a Destination

Companies everywhere are striving to become holistically digital, but few have fully accomplished this. Yet the Digital Transformation started quite some time ago. It was 1951 when the British catering company J. Lyons & Co. ran its first business application using a computer uniquely built to their specifications. It was modeled after Cambridge University's EDSAC computer and built to solve the problem of production scheduling—its primary task being to ensure the on time delivery of cakes and chocolates to the hundreds of Lyons tea shops around England. A worthy cause to be sure.

Almost seventy years after J. Lyons & Co. unknowingly triggered the start of the Digital Transformation, most companies are still not fully harnessing the power of digital technology. As they are evolving, many companies aspire to manage their processes in a wholly digital manner—both their inward-facing processes (manufacturing, operations, Human Resources, etc.) and their outward-facing processes (sales, customer service, billing, marketing, etc.) But most have yet to reach this goal.

Digitally native companies (such as online platforms as

Uber and Airbnb) are the exception to this truth since they are fully digital already, as the term would imply. As these new companies lead the way into the future, other companies will continue to follow suit. Eventually.

As I said, the Digital Transformation is easier to claim than to execute. Even though the common perception is that we as a society are just a couple of steps away from being fully digital, the reality is that there are still many roadblocks in our path. There are still numerous devices to manage; an endless amount of data to be shared, analyzed, and utilized; and countless problems to solve. Why is this?

For many years now there has been considerable talk about the Digital Transformation. And not just talk, but action. Most any given company—big, medium, and small alike—is willing to put their money where their mouth is on this topic. Businesses regularly spend sizable chunks of their budgets on Digital Transformation. In fact, 96 percent of companies have already started investing in this and they have spent one trillion dollars on it in the last year alone.

The World Economic Forum has estimated that the potential global impact of these activities will total 100 trillion dollars. A 1:100 ratio seems more than worth the investment, right? So why then, when surveyed, did 20 percent of the CEOs of these same companies declare these activities to be a waste of time? And another 60 percent said they were confused about them? Where is all this discouragement coming from? It comes from a misunderstanding of the terminology.

Transformation implies a completed change of status—from one element into another, or from an old object into an entirely new object. When a worm evolves into a butterfly, we call this a transformation. When a raw material is worked and shaped into a product, we call that a transformation too. When it comes to Digital Transformation, however, the word “transformation” here is a misnomer—we actually mean something different. We just cannot effectively describe new things with old words. When we

refer to a Digital Transformation, we are not referring to something that has happened; such as an end-result or a completed creation, but rather it is something that is happening as an ongoing process or evolution. Digitalization is a journey, not a destination.

Hence the frustration. Companies are following a moving target, and so they think they have somehow missed the mark. They can neither see nor reach the end of the process, and so they feel that they are not achieving their goals or that this somehow indicates that they are doing something wrong. The only way in which they are wrong, however, is in not understanding that this kind of transformation is, by its very definition, a never-ending process. After the so-called Digital Transformation, it will follow the Artificial Intelligence Transformation, and so on. Welcome to a perpetual beta version of existence.

Before talking about AI Transformation, allow me to take a step back and tell you why everything started with Big Data. It will make easier to understand why AI Transformation is the solution.

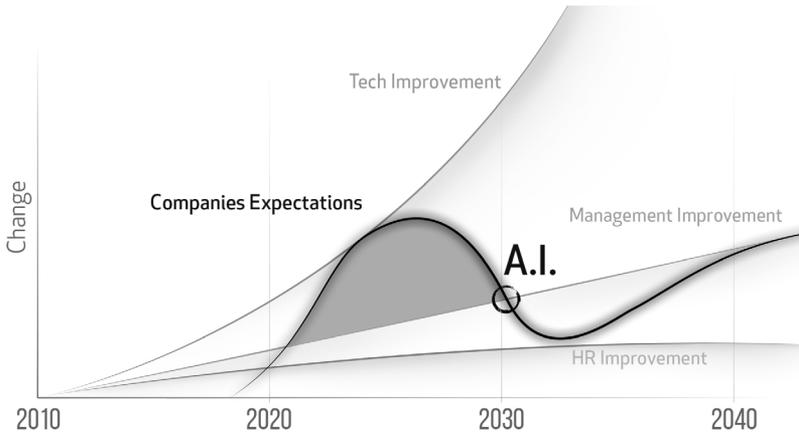
### The Paradox of Digital Transformation

Here is a interesting statistic: looking at the last 60 years, the historical rates of adoption of digital innovation show that the time from commercial availability to 80% adoption is on average 16-18 years. This range of times for adoption was observed for both hardware-based technologies and the ones available online, including widely-used social media applications.

Look at Facebook. It was launched in 2004 and became the largest social network in the world in 2012, with more than one billion users. But Facebook was not the first of its kind, and we are talking about the innovation, not a particular company. If we consider Facebook's predecessors, Classmates was launched in 1995, Sixdegrees in 1997, and mySpace in 2003. From 1995 to 2012 is a span of 17 years.

The rate of digital innovation is growing exponentially,

yet the rate of digital adoption has not accelerated over the last 60 years. The concept that I developed to explain this is the Paradox of Digital Transformation. With companies' ever-increasing expectations driven by emerging digital technologies, products, and services, managers are struggling to keep their organizations afloat. Why?



*The Paradox of Digital Transformation [Vito Di Bari - WEF Davos, 2019]*

The average growth of digital adoption is logarithmic, yet digital innovation grows at an exponential rate. Companies cannot give up on technological upgrades nor slow down the rate of digital innovation. But organizations cannot grow as fast as the digital innovations available to them, because you simply cannot upgrade people as you do with a new software. So organizations evolve and keep pace to the best of their abilities, but the gap widens over time.

The current generation of managers is tech savvy but the digital innovation grows so fast and the scope of improvement has expanded so dramatically that market expectations are growing exponentially too. As a consequence of this, managers cannot meet CEOs' and shareholders' expectations – no matter how much

effort they put forth, no matter how good they are. After an initial period, the expectations start to grow dramatically because they are a derivative of the digital innovation growth.

This is what I mean by the Paradox of Digital Transformation. “The present generation of managers is the most competent and tech savvy ever, yet shareholders’ expectations have never been so unmet by management as today.” This sense of un-fulfillment is typical of transformation periods. But it will decline when AI becomes a commodity.

This difficulty in keeping up started when the digital world forked, no longer limited to computers on the web, but expanding to include mobile devices as well. One day we woke up and there was a second major kind of digital connection –smartphones. The digital world had doubled overnight, and the time spent per day by adult users on digital media doubled too. It is notable that, according to an eMarketing researcher, mobile phones did not take away any attention from connected computers, but instead they added the same amount of time to our digital life that we already spent on computers before.

Keeping up with just two main avenues was already challenging enough, and now things are getting even more complicated. The digital world will lead to a cornucopia of new client interfaces that will drastically change the scenery of the digital marketing channel. The next media will be AR/MR glasses and headsets; digitally delivered 3D physical items; smart watches, smart homes filled with all kinds of smart objects; connected cars; wearables and appliances; geolocation-based mobile and voice controlled bots.

Remember the two-way fork between web and mobile? Those were the good old days. It’s a transformation that brings to mind a Peanuts comic strip by the late Charles Shultz. Snoopy and his bird companion Woodstock are on the roof of Snoopy’s doghouse, as usual. They’re bored and don’t know what to do. “When we were kids, it was easy to have fun,” says Snoopy. “We would play tag. If you were behind you were running to catch the other

one, and if you were in front you were running so you weren't caught. But we were always running.”

This cartoon is about reflection. Snoopy and Woodstock think, “We had more fun years ago when the rules were simple.” It's the same frustration that the present generation of managers is going through. The world is rapidly changing before their very eyes and they cannot keep up the pace. Luckily, Artificial Intelligence will help us to resolve these problems, and will allow us to govern the increasing complexity of data.

Nowadays, the trend of digital transformation is all about aaS. The acronym “aaS” stands for “as-a-Service”, and it's a distribution model in which a third-party provider makes available something to customers over the Internet. Cloud computing includes three main categories of aaS: Software as a Service (SaaS), Infrastructure as a service (IaaS) and Platform as a Service (PaaS). The future of digital transformation is splitting into two directions: Data-as-a-Service (DaaS) and AI-as-a-Service (AIaaS). Before talking about AI, let's have a look at data first.

## The Big Bang of Data

In 2002, a report from the University of California Berkeley's School of Information Management and Systems, estimated that the human species has created five exabytes of data, counting from 10,000 years ago—when it was as simple as graffiti drawn on cave walls—until 2001. This data was placed on many mediums, including papyrus, paper, film, records, and digital recordings.

Five exabytes are composed of 5 billion gigabytes, and that's a lot of bytes. Then, in 2002, what happened? We created, in the space of only one year, the same amount of data that we had created in the last 10,000 years of civilization—five exabytes! The world was astonished. The Datasphere was born, and I started thinking about its consequences.

From 2003 to today, we have created about 120 zettabytes of information. This includes Tweets, Facebook posts, Power-

Point presentations, teenager's Instagram photos, and even this book. 120 zettabytes is slightly more than 120 trillion gigabytes of information.

Big Data is already driving most companies crazy, simply because they don't know how to manage it. Are we ready for the Big Data deluge? No, we are not. But with AI we'll get ready fast. (And without AI, the world will become an intricate mess.) All that data will become a gold mine, but only for those who can learn how to process it all. And we will need AI to filter that magnitude of data. It's an enormous challenge, but we will be equipped. Don't forget that today we have much more processing power to handle Big Data than even a few years ago. One single smartphone has more computing power than any of the computers used by NASA in 1969 to send men to the moon.

The term "Big Data" was first introduced nearly two decades ago. However, it was not commonly used until the last few years, when Information and Communication Technology (ICT) corporations started to promote the "cloud" as a place to organize data. Today, everybody is telling us that data is big, and that this is a problem. They are wrong, twice over.

Data is going to be even bigger than forecasters expect—a lot bigger. But it will not be a big problem. Thanks to AI, it will be a big opportunity. I believe that by 2025, Big Data will create 12 million jobs in Information and Communication Technology, will open employment opportunities for 35 million people outside of the ICT sector, and will create a \$13.5 trillion in market growth for the ICT industry. Does that look like a threat or an opportunity?

Big Data will underpin new waves of productivity growth. On a global scale, real-time data analysis will enable us to predict climate changes, as well as to effectively diagnose and control epidemics, saving millions of lives. In fact, Google's founders, Sergey Brin and Larry Page, have made a request for government regulators to not obligate them to delete user internet searches within a certain time frame. They believe that, in the future, tracking tools will be used to control pandemics, correctly predict nat-

ural catastrophes, conserve and manage precious resources (such as water and energy), and make huge breakthroughs in genetic research.

Big Data is going to be a lot bigger than we are anticipating because of the speed of the growth that will occur. The growth will present great challenges, but it also will offer amazing business opportunities. The question is, how many companies will be able to turn an information overload into an information advantage?

A dozen years ago, I forecast in a paper for the Harvard Business Review that by 2025 the world would create slightly more than 200 zettabytes of data—one zettabyte being one trillion gigabytes. I'm still convinced about this number, although the International Data Corporation (IDC)—and everybody else—said the amount of digital data was going to grow through the end of 2025 to just over 50 zettabytes, one-fifth of my estimate in 2007.

I forecast 200 zettabytes in 2007 and I am actually starting to think that I was a bit too conservative. (After all, it was sixteen years ago.) But regardless, let's continue on with this number. If it is accurate, that would mean that by the end of 2030, we will generate the same amount of data in ten minutes that we created in the first 10,000 years of civilization. To put the numbers in perspective, the personal data created every single day would be the equivalent of streaming 61 billion Netflix movies. If you were to store 200 zettabytes on DVDs, your stack of DVDs would be long enough to circle Earth 253 times. And if you attempted to download 200 zettabytes at the average current internet connection speed, it would take you 2 billion years to download. Even if you enlisted every person in the world to help with the download, it would still take ninety-two days.

Now think about it: the volume of data is going to skyrocket because whatever we do with our smart objects will be counted. Our actions will be ranked and recorded every single second of the day. We will come out of a deep REM phase of sleep and open our eyes at 8:43 a.m., have a shower in eight minutes, and brush

our teeth in three. Then we will put on a white shirt, blue socks, and a tie with little yellow diagonal stripes. Our temperature will be perfect, but our blood pressure a bit high. Our breakfast croissant will be the perfect golden brown but the coffee too hot, and so on. Through sensors, IoT smart objects, and mobile devices, all of this data will be scored and stored to be analyzed with the support of AI software. We will realize it when we start receiving email messages about exotic body washes, finding an advertisement for a sale on blue socks, and being welcomed by a smiling shop attendant with a handful of striped ties in his hand. Oh yes, we will know it. We will know that we are the mine and that they have dug for their data.

As of today we produce in one year 120 zettabytes of data, but only half a percent of them are analyzed. With the help of AI we will be able to manage, analyze, store, and distribute all of them. AI is all about taking control, not losing it.

I named the data explosion the “Big Bang of Data.” Normally, the word “bang” is associated with the destruction or demise of something. However, just as with the original cosmic Big Bang, which gave birth to the universe, the Big Bang of Data will give birth to a new age: The AI Transformation.

### Everything Comes at a Cost

Some of us believe faithfully in innovation, while others fear it irrationally. Both approaches are the result of bias. On the one hand, there is widespread prejudice against innovation, which is founded on the belief that it kills employment—and we will talk more about this later. Yet on the other hand, there is also a naive belief that innovation automatically corresponds with progress. I am not convinced of either. Let’s take these two opposing biases and examine them in the next paragraphs. It will be helpful to address this here, so that we can approach the chapters on emerging technologies and the new normal with an unconcerned mind.

I think game-changing innovation always comes with a

price; and that we must pay closer attention to the balances that we endanger through the mass adoption of emerging technologies. I think we need to evaluate the possible damages beforehand and try to prevent them. Of course, this is the job of legislators, but it is also the result of a collective conscience and of personal reflection and growth. Therefore we are all involved—from companies and experts who must foresee the risks and assess their impact, to the media that must disseminate information, to individuals who must take charge of their own share of our collective civil conscience.

I firmly believe that now is the time for entrepreneurs, CEOs, managers, and courageous professionals to jump on the bandwagon of the AI Ecosystem, formed by Artificial Intelligence and emerging technologies. But I want to qualify that statement with a reminder that we must be careful with how we manage the innovation and be conscious of its implications—because there is always a price tag attached to any game-changing innovation.

Incremental innovations simply enhance or upgrade existing products, services, processes, or production methods. They have a low impact on the way we live and work. A radical innovation, on the other hand, has a significant impact on the economy, on specific markets, and on lifestyles. My belief—verified in dozens of case histories—is that every time civilization makes a huge leap forward, future generations pay a price; although that price will be less than the cost of the problems we solve.

In 1974, University of Southern California economist Richard Easterlin formulated what has become known as the “Easterlin Paradox” by stating, “Once you reach the level of comfort in life, any increase in income creates a certain decrease in happiness.” Let me paraphrase this to express my own paradox: “Any radical innovation allowing you to reach a level of better comfort in life will create a certain decrease in quality of life to your descendants.”

Take air conditioning, for instance. First invented by Willis Carrier in 1902, vapor compression air conditioning is very energy-intensive and environmentally harmful. When we run an air

conditioning system, we don't get something for nothing. If we cool something, we heat something else. That heat goes into the environment, and we will suffer the consequences in the decades to come.

In the past, many decades or even centuries would elapse between radical innovations. People had vivid memories of the problems they just escaped but were oblivious to the problems they were creating. They cashed in on the benefits long before they started to see the damages. However, in the modern world time is—in a sense—speeding up. We're becoming more aware of the damaging effect because the cycles are getting shorter and life expectancy is getting longer.

It's a matter of fact that we have very short memories when it comes to our personal histories. Try this simple test: say the names of your four grandparents. Done? That was easy, right? Now, try again with your eight great-grandparents. If you can name all of them, you are an exception. Some of us don't even know the name of one of them—me included.

Now, let's look at the flip side. With the average life expectancy increasing we may get to know our great-grandkids, but it's unlikely that we will meet anyone from the following generation. Are we going to be worried about the world we are leaving to that generation? I hope so. But our ancestors apparently weren't worried about the world they were leaving us. They simply were not aware of the fact that radical innovations solve problems but create other ones that require yet more radical innovations to eradicate. Is there an end to this cycle? I think so, or at least there can be.

I envision a world where we will predict the possible problems that will arise from the adoption of radical innovations and act proactively to prevent them. This will be a more responsible and thoughtful world, where we look not only for the easy benefits of an innovation but seek to eliminate its downside. The question on the table today is whether we can have radical innovation without causing radical damage. The answer had better be "yes" because we're doing irreparable damage to the global community and to the planet.

## Digital Transformation Incomplete? That's Good News!

In the next chapter we will talk about the technologies that form what I call “The AI Ecosystem.” Then we will see how to introduce AI in a company and how to be ready industry by industry. But first we need to set our goals; we need to think strategically.

If your own Digital Transformation is still incomplete, that may be good news. Very good news, in fact, because we are now at the dawn of a new age: the Artificial Intelligence Transformation Age. You may want to use this pause as an opportunity to start connecting with the future. You may want to upgrade your business model to utilize things such as smart objects, Experience Reality, 3-D Printing, and Cobots. These types of emerging technologies will improve products and services in all sectors; most of all agriculture, healthcare, transportation, education, and public governance.

The merging of Artificial Intelligence, robotics, 3-D Printing, and the Internet of Things will open the way to Industry 4.0, or the so-called “Fourth Industrial Revolution.” In Industry 4.0, processes will be enhanced to reduce set-up, integration, and response times, and to deliver better and more customized products at a lower cost.

We are going to talk about what to do to integrate Artificial Intelligence into strategic planning, upgrade your business models, and scale AI to AGI. So that eventually you can try to apply this formula to your own business. Let's take a look at the future, and how these technologies will change the way we work.

### Integrating Artificial Intelligence into Strategic Planning

The integration of Artificial Intelligence into strategic planning is an emerging game-changer to stay ahead of the competition.

Artificial Intelligence can streamline repetitive and time-consuming tasks. For example, Amazon's adoption of AI-powered robots in its fulfillment centers exemplifies the im-

pect of workforce automation. These robots, known as “drive units,” navigate the warehouse floor autonomously, improving order accuracy and fulfillment speed, while employees focus on higher-value tasks.

Incorporating AI into strategic planning is crucial for companies undergoing Digital Transformation. Chatbots, virtual assistants, and recommendation engines are some AI-driven tools that enhance customer engagement and streamline processes. For example, Netflix leverages AI algorithms to analyze viewer preferences, viewing patterns, and historical data. This enables them to enhance the user experience and customer satisfaction by offering personalized content recommendations. Fintech companies, such as Ant Group and PayPal, also leverage AI algorithms to analyze vast amounts of financial data, detect fraudulent transactions, and provide personalized financial recommendations to customers. AI-powered analytics have propelled these companies to the forefront of digital disruption, transforming the way financial services are delivered.

Artificial Intelligence can optimize everyday business processes by automating complex decision making tasks, reducing errors, and improving accuracy. From data analysis to supply chain management, AI-powered systems offer support, augmenting human capabilities and enabling faster, Data-Driven Decision Making. For example, the United Parcel Service (UPS), a global logistics company, employs AI-powered route optimization algorithms to determine the most efficient delivery routes, considering multiple variables like traffic, weather, and package volume. This optimization not only minimizes fuel consumption and reduces costs but also ensures timely deliveries, enhancing customer satisfaction.

Chatbots powered by Natural Language Processing (NLP) algorithms have become commonplace in customer support. Companies like Apple, Google, and Microsoft employ AI-powered virtual assistants, such as Siri and Google Assistant, to handle customer queries, provide personalized recommendations,

and perform various tasks. This AI-driven approach significantly improves response times and reduces costs—further enhancing customer satisfaction. AI-driven business intelligence empowers organizations with deep insights into market trends, consumer behavior, and competitor analysis. By leveraging advanced data analytics and Machine Learning algorithms, businesses can gain a competitive edge by uncovering hidden patterns, predicting future trends, and making informed strategic decisions. For example, Airbnb utilizes AI-powered analytics to gather vast amounts of data from user reviews, booking patterns, and market trends. By analyzing this data, Airbnb gains valuable insights about user preferences, demand patterns, and pricing strategies—enabling them to optimize listings, increase occupancy rates, and deliver personalized recommendations. Netflix also understands individual viewing patterns and fuels their position as a leading streaming platform by optimizing user engagement, retention, and content production decisions.

Once you understand the most beneficial way to integrate Artificial Intelligence into strategic planning, you are ready to plan how to upgrade your business models.

### Future-Proof Your Business Model

We must ensure that in the long term our organizations are future-proof; that they can survive change. Because there will be change, you can count on that. Will our business models be disrupted by AI and the emergence of new technologies? Are our organizations aligned with the AI Transformation of research and development, production, marketing, and distribution?

But we also need to think in the medium-term. Despite this, we frantically chase short-term incremental innovations—both technological and organizational—without ever finding time to stop and reflect on the context of that evolution. I call this “The White Rabbit Syndrome.”

Do you remember *Alice in Wonderland*? Throughout AI-

ice's magical journey, a white rabbit appears with a round belly and a watch hanging by a chain in his pocket. He's always in a big hurry, grumbling "I'm late, I'm late, I'm late" every time he shows up, then taking off to some unknown destination. If you think about it, the White Rabbit is the *raison d'être* for Alice's journey. Alice was bored at the picnic with her sisters when she saw him rushing into a rabbit's hole. She became curious and went in after him. She wanted to know where he was going. As a result, she ended up following him all over Wonderland.

In the story, the White Rabbit appears to Alice, and he always acts as if he has no time for her curiosity. Alice wants to stop him and ask him questions to satisfy her curiosity, but he always manages to get away, excusing himself without giving her any meaningful answers. Near the end of the story, Alice plants herself firmly in front of him and succeeds in blocking him. But the White Rabbit wiggles past, saying "I'm late, I'm late, I'm late!" Exhausted and out of breath, she blurts out, "I only want to ask you a question! Where are you going?" The White Rabbit halts, taken aback, thinks about it for a moment, looks her in the eye, and responds, "Well, I don't know, but I'm late."

Until today, we have all been very much like the White Rabbit: chasing a future that we aren't really sure about. It has proved to be a moving target, impossible to reach. Then the COVID-19 pandemic forced us to a halt, and we realized that the future should not be chased, but anticipated. We need to understand what will change in our sector when AI is widely adopted and ask ourselves if our company has a business model that is prepared to absorb the impact of that change. After this assessment, we must then set goals that put our company in a safer position. This is our line of defense.

The next step is to ask ourselves if we can navigate emerging technologies to gain a competitive advantage and lead the change. This is our line of attack. Almost always, the answer is "yes, we can do it," even if it's not so evident how.

AI itself is not a standalone business model but it will

enable businesses to automate processes, analyze data, gain insights, and improve decision making. It can enhance efficiency, personalize customer experiences, optimize operations, and drive innovation.

Business models determine how a company creates, delivers, and captures value. AI can be integrated into different types of business models to enhance their offerings and competitive advantage. Let me give you a few examples.

1. Product-focused business models:

Companies can develop AI-powered products or services as their core offering. This could include AI-driven chatbots, virtual assistants, recommendation systems, or predictive analytics tools.

2. Platform business models:

AI can be utilized to create intelligent platforms that connect users or facilitate transactions. Examples include ride-sharing platforms that use AI algorithms to match drivers with passengers or e-commerce platforms that provide personalized product recommendations.

3. Data-driven business models:

AI can unlock value from large amounts of data, enabling companies to monetize data or offer data-driven insights to customers. Companies can leverage AI to analyze customer behavior, identify trends, and provide data-driven recommendations.

4. Process optimization business models:

AI can streamline and optimize internal processes, reducing costs and improving operational efficiency. For example, companies can implement AI-powered automation solutions to streamline supply chain management, inventory optimization, or predictive maintenance.

### 5. Artificial Intelligence as a service business model:

Some companies offer AI capabilities as a service, providing access to AI tools, algorithms, or platforms for other businesses to leverage. This allows companies without extensive AI expertise to benefit from AI technologies.

It is important to note that successfully incorporating AI into a business model requires a thoughtful transformation strategy, considering factors such as data availability, infrastructure requirements, talent acquisition, and customer acceptance. The specific business model will vary based on the industry, target market, and value proposition of the company.

### Redesigning Business Models

If we want to adopt a new business model, we cannot stop using the previous one until we are sure that the new one works. I suggest experimenting with the new business model, while you shrink the non-critical activities connected to the current one. Think of Steve Jobs. He was brave enough to think in the medium-term, getting out of the golden market of computers in 2003, and entering the music industry with iTunes. He followed that up in 2007 by jumping into the telecom industry with the iPhone. Steve Jobs saw the even greater innovation hidden behind the already great one. As you may recall, he was recovering from a failure. In a 1985 power struggle, he was forced out of Apple, the company he cofounded.

We must embrace a culture of rewarding risk-taking and forgiving failures. However, we cannot expect two different business models to coexist for a long period of time. So we have to speed up our experiments and reach a conclusion—any conclusion. Positive or negative, it doesn't really matter. As long as we are open to learning from the failure and starting our experiments again and again. And again.

As for role models and failures, would you like to know

my favorite cartoon character when I was a kid? You'd probably never guess it was Wile E. Coyote! You may remember him. He and the Road Runner, a fast-running ground bird, were the stars of a Looney Tunes and Merrie Melodies series of animated cartoons.

Wile E. Coyote repeatedly attempts to catch the Road Runner but is never successful. He invents incredibly complex, over-engineered devices to perform a straightforward task in a complicated fashion. They often include chain reactions, no doubt inspired by the machines of Rube Goldberg. Wile's machines comically backfire, with Wile invariably getting injured each time. Nevertheless, in the next episode he's back, inventing yet another a new machine.

All of my friends considered Wile E. Coyote to be a pathetic loser, but he was my hero. I found him to be creative, innovative, and persistent—and yes, strong enough to accept his failures. Gosh, I really admired him. He was a true out-of-the-box thinker, and I watched every episode of the series hoping that someday he'd figure out how to catch that stupid bird.

My advice is, “Fear not failing.” Most of the companies disrupted in the last decade did it. Just make sure as you fall to do it fast, and then to try again. The name of your real enemy is “atychiphobia”, or the fear of failure. That's when we allow our fears to stop us from doing the things that can move us forward to achieve our goals.

Where are we now? The companies that will survive the pandemic and the subsequent recession are those with the resilience and flexibility to rapidly redesign their business models and reposition themselves to explore alternative futures. Consider that most companies tend to postpone adventures outside of the comfort zone of their core business. The decisions, postponed from year to year, usually lead to ongoing adjustments of the core business to try to fight a progressive decline. A slowdown is accepted for fear of the risks associated with a change. Atychiphobia.

Companies become prisoners of the present and do not realize that the present leads them to replicate the past to the detri-

ment of the future. When the need to change becomes unequivocal, the point of no return has already been exceeded. Companies like Blockbuster, Blackberry, or Kodak received weak—but very clear—signals of their future disruption a dozen years before their failures. And yet they did not heed the warning signs.

The good news is that with the advent of AI, I expect less resistance to changing business models. I'm expecting many companies to embrace AI and rethink their business models, although this is not an easy task. These companies must evaluate not only if the opportunity for change they see is worth the risk, but they must also figure out how to communicate the change to the whole organization with a sense of higher purpose. They need to engage their workforce and inspire them to renounce the safety of the known for the siren call of the unknown.

This consensus cannot be taken for granted. Let me give an example. Say that you are a publishing company and you own a daily newspaper, as well as some weekly and monthly magazines. Your possible alternative business model is clear: streaming digital content. Will the journalists for your newspaper and magazines cooperate to build this new avenue? I've been a columnist of newspapers and printed magazines, so I have watched from a front row seat the struggle of publishers. I can tell you that it was a painful and tense transition because the writers did not support it—no matter how likely this transition was going to save their jobs. They didn't know how to accomplish it. It required skills that they didn't have, and they were not willing to go the extra mile to learn them because they never bought into the new business idea. With the AI Transformation this will happen again. There will resistance to change; there will be survivors; there will be newcomers.

The reason why the redesign of a new business model often fails is that companies try to move seamlessly from one business model to another. It is necessary to design a dual strategy in which the core business is repositioned, while nurturing the new one. It's what Apple has done by empowering its core business

with iMac and iBook, while disrupting the concept of internet computers itself with iPods, iTunes, and iPhones.

If we want to combine a new business model with the core business of our company, we must be ready to give up all the previous activities that are not synergic. We need to leverage our core business to support the launch of the new one, from the brand name to the customer database, from production skills to supply chain management and distribution. Look at Amazon.com. While empowering its core business, it also opened up to food delivery and physical stores—buying Whole Foods and launching the next generation retail chain Amazon Go. Amazon has worked on the launch of alternative business models based on the two strengths of its core business: their customers and their online expertise. Their growth has also led them to build the world’s largest cloud computing enterprise. Think about it. A great portion of the profit of the biggest online retailer comes from cloud services—a non-core business operation. Now that’s what I call redesigning a successful dual business model. Let me close this chapter with an example of a dual business model: an AI-based case history about Uber’s strategy to dominate global autonomous ride-hailing services.

### Transforming the Ride-Hailing Industry in Two Steps

In the ride-hailing industry, the initial phase of adopting AI was the emergence of apps like Uber and Lyft, which connected passengers with human drivers using AI algorithms to optimize routing and pricing. This first phase created a significant business opportunity as people embraced the convenience and cost-effectiveness of these apps. Uber and Lyft are rapidly disrupting the taxi industry as we have all got used to them. It seemed to us that this was a big change but in reality, the innovation was incremental and not radical. It had only changed our way to call a taxi and the drivers were no longer full time professionals, but ordinary people who used their free time and their own car. This was just

the first trend, what about the second?

The second and more important phase in the ride-hailing industry was the development and deployment of autonomous vehicles. Uber recognized that the real opportunity lies in creating a long-lasting change by leveraging AI and self-driving technology. For instance, Waymo, a subsidiary of Alphabet Inc., has been at the forefront of developing autonomous vehicle technology. By removing the need for human drivers, autonomous ride-hailing services aim to provide safer, more efficient, and cost-effective transportation. The initial reaction of people to ride-hailing apps with human drivers created a business opportunity valued at billions of dollars. However, the forecasted limited life cycle of this opportunity prompted Uber to explore the second trend of autonomous ride-hailing services, which holds the potential for a more transformative and lasting impact, and it's expected to drive substantial market growth and reshape the industry in the coming years.

By 2026, the global ride-hailing market is projected to reach \$285 billion, while the newborn global autonomous vehicle market is expected to reach a market size of \$556.67 billion and start disrupting the rental car industry and the dealership sector of automotive. It would disrupt Uber too, but they are future-proofing their business model, ensuring they are well-positioned to capitalize on the evolving landscape of AI-driven ride-hailing services. Let me tell you how.

By leveraging smartphone technology and GPS tracking, Uber changed the way people book and experience rides, offering a convenient and reliable alternative to traditional taxis. As Uber established its dominance in the ride-hailing market, the company recognized the potential of emerging technologies, particularly autonomous vehicles, to further transform transportation. They identified that self-driving cars could improve safety, reduce costs, and enhance the overall efficiency of their services.

The driver represents the single largest expense in non-autonomous ride-hailing, at 80 percent of the total per mile cost ac-

According to estimates by research firm Frost & Sullivan. By removing the driver from the equation, fully autonomous vehicles will dramatically lower the cost of a ride while boosting its addressable market. Already using AI to offer software as a service, Uber is using AI to take the bet further by making the cost of rides so low that vehicle ownership becomes obsolete. Uber's evolution from a ride-hailing app to autonomous ride-hailing services represents a strategic shift aimed at transforming the future of transportation. This transformation aligns with the company's vision to revolutionize mobility and provide efficient, safe, and affordable transportation options.

To accelerate the development of autonomous ride-hailing services, Uber entered into strategic partnerships and made significant investments. They collaborated with leading autonomous vehicle manufacturers, including Volvo and Toyota, to integrate self-driving technology into their fleet. Uber established its Advanced Technologies Group (ATG), a dedicated research and development division focused on developing autonomous vehicle technology. The ATG team worked on enhancing sensor technology, Artificial Intelligence, and Machine Learning algorithms to enable self-driving capabilities.

Uber conducted extensive testing and pilot programs to validate the feasibility and safety of autonomous ride-hailing services. They deployed autonomous vehicles in select cities, such as Pittsburgh and Phoenix, allowing users to experience self-driving rides under controlled conditions. Uber's long-term strategy involves transitioning from a platform that connects drivers with passengers to a fully autonomous ride-hailing service. The company aims to replace human drivers with self-driving vehicles, offering enhanced safety, cost-efficiency, and scalability.

Autonomous ride-hailing introduces complex regulatory challenges, so Uber is actively engaging with policymakers and authorities to ensure compliance and shape regulations conducive to autonomous vehicle deployment. This collaboration is crucial to address safety, liability, and infrastructure requirements. Uber's

success in transitioning to autonomous ride-hailing services ultimately depends on consumer adoption, the challenge is not going to be easy but it's definitely worth the investment because will put Uber in pole position to establish a dominant position in the global autonomous ride-hailing services—a market that I estimate hitting \$7 trillion by 2030

# THE AI ECOSYSTEM

## The AI Transformation is an Ecosystem

Artificial Intelligence and emerging technologies have been around for a while, but recent advancements have made them more powerful and accessible than ever before. The rise of processing power, data storage, and digitalization has paved the way for a new era of innovation, one where these technologies are not only transforming how we do business but also creating new opportunities that were once unimaginable. For instance, in healthcare AI is being used to diagnose diseases, develop new treatments, and improve patient outcomes. In retail, AI is being used to personalize the shopping experience, optimize pricing and promotions, and improve supply chain management. In construction, AI is being used to optimize project management and improve safety. At the heart of this transformation is the connection between AI and emerging technologies—such as IoT, Experience Reality, Cobots and 3D Printing.

The Internet of Things (IoT) refers to the interconnected network of physical devices, vehicles, buildings, and other objects embedded with sensors, software, and connectivity. This network generates massive amounts of data, which can be analyzed using AI algorithms to gain insights and make predictions.

Experience Reality (XR)—also known as Mixed Reality—refers to the combination of the physical and digital world, creating a new environment where virtual and physical objects can interact in real-time. This technology has the potential to enhance many industries, such as healthcare, education, and entertainment. AI algorithms can be used to create more realistic and immersive experiences in XR environments.

Cooperative robots—also known as Cobots—are designed to work alongside humans in a shared workspace. These robots are equipped with sensors and AI algorithms that allow them to adapt

to changing environments and collaborate with humans on various tasks. They have the potential to increase productivity and efficiency in many industries, such as manufacturing and healthcare.

3D Printing is a technology that allows for the creation of three-dimensional objects from a digital file. This technology has the potential to revolutionize manufacturing, as AI algorithms are being used to optimize the design and production process.

While AI and these technologies may seem like separate entities, they are deeply intertwined, with each one enabling and enhancing the other. AI, for example, relies on the data gathered by the IoT to learn and improve its decision making abilities. Meanwhile, the IoT would be nothing without AI to make sense of the vast amounts of data it collects. The same goes for other emerging technologies, like 3D Printing, Experience Reality, and Cobots, which are all dependent on AI to function effectively.

The IoT is one of the most prominent examples of this connection. By connecting devices and gathering data in real-time, it has enabled businesses to optimize their operations and create new business models. In retail, for instance, IoT sensors can track inventory levels and send alerts when stock is running low, while also gathering data on customer behavior and preferences. This data can be analyzed by AI to optimize pricing and promotions to improve the customer experience and driving sales.

3D printing is another emerging technology that is benefiting from the power of AI. By using AI to analyze data from sensors, manufacturers can optimize the printing process to reduce errors and improve quality. This has led to significant cost savings, as well as faster prototyping and production times. For example, the aerospace industry has used 3D Printing and AI to create parts for aircraft engines, reducing weight and improving fuel efficiency.

Experience Reality is another area where AI and emerging technologies are converging. By creating immersive experiences that blend the physical and virtual worlds, Experience Reality has opened up new possibilities in training, sales, and marketing. In

healthcare Experience Reality is being used to simulate surgical procedures, allowing medical professionals to practice and refine their skills in a risk-free environment. AI can enhance these simulations by analyzing data from the virtual environment, providing feedback and guidance to the user.

Cooperative robots are an emerging technology that is transforming the way we work. By working alongside humans, they can improve productivity and safety, while also freeing up workers to focus on more complex tasks. AI plays a critical role in enabling these robots to learn from their environment and adapt to changing conditions. In the automotive industry, for example, cooperative robots are used to assemble cars, with AI analyzing data from sensors to optimize their movements and improve efficiency.

As I said before, there is an inseparable connection between AI and emerging technologies. While they may appear as separate entities, the truth is that they are deeply interdependent, with each one enhancing the other's capabilities.

## Medium Matters

Artificial Intelligence has already become an increasingly ubiquitous part of our lives—from personal assistants like Siri and Alexa to self-driving cars and advanced medical diagnosis systems. While AI has many practical applications, it also represents a fundamental shift in the way we process information and make decisions. As Marshall McLuhan noted in his 1964 book *The Extensions of Man*, all objects are extensions of some human faculty, and AI is no exception.

Some of you may recognize the name Marshall McLuhan. He was a Canadian educator whose writings shook up the media establishment nearly a half century ago. He's most famous for coining the phrase, "The medium is the message," which was parroted by tens of thousands of professors and college students during the 1960s—most of whom didn't have a clue what he really meant. This great futurist and student of the media also wrote, "All objects

are extensions of some human faculty—psychic or physical.”

Let me expand on McLuhan’s insight and ask you: What is going to happen when AI will be an extension of our brain? All digital objects will be extensions of our hybrid brain. More specifically, I see them as extensions of that part of the brain called the “corpus callosum.”

The brain’s left hemisphere controls the conscious mind and is associated with logic, talking, writing, and the dimensions of space and time. The right hemisphere, on the other hand, deals with memory, creativity, intuition, and the social and emotional aspects of our lives. I’m always amused by the debate over which hemisphere is the most important. Let me ask you: If you had to make a choice, which hemisphere would you give up—the right or left? Hard to decide, isn’t it?

My answer is: neither. I say the most important part of the brain is the corpus callosum. The two cerebral hemispheres, left and right, are interconnected by this white blob. It’s only about four to six centimeters long but consists of 200 million nerve fibers. Each fiber reaches from one hemisphere of the brain to the other and allows information to flow between them. The fibers intersect in millions of places where they can form synapses—the chemical location where they communicate with each other. These synapses together form the network, or the circuit, of the brain.

Although the two halves of the brain have separate capabilities and can survive independently, the corpus callosum allows us to integrate the two sides and function as complete human beings. In short, it is the corpus callosum that makes us who we are. It plays a critical role in our ability to process information, make decisions, and interact with the world around us.

One of the most compelling examples of AI as an extension of the corpus callosum comes from the field of neuroscience itself. In recent years, researchers have been using AI to study the brain in ways that were previously impossible. For example, a team of scientists at the University of California, San Francisco

used Deep Learning algorithms to analyze brain scans and identify patterns of activity that corresponded to different thoughts and experiences. This kind of research not only sheds light on how the brain works, but also suggests that AI can help us understand our own cognitive processes in new ways.

Another example of AI as an extension of the corpus callosum comes from the world of medicine. AI systems are increasingly being used to diagnose and treat a wide range of medical conditions—from cancer to heart disease to mental illness. For example, a team of researchers at Stanford University developed an AI system that can diagnose skin cancer with a level of accuracy comparable to that of human dermatologists. This kind of AI-assisted diagnosis not only saves time and money, but also improves the accuracy and reliability of medical diagnoses.

The implications of AI as an extension of the corpus callosum go beyond practical applications, however. They raise profound questions about what it means to be human, what consciousness is, and how we should approach the development of advanced AI systems. As philosopher Daniel C. Dennett notes, “Artificial intelligence is the philosophy of the future.” Dennett argues that AI systems will force us to confront fundamental questions about the nature of consciousness, agency, and free will.

One of the most pressing concerns about AI as an extension of the corpus callosum is the potential for these systems to become autonomous and self-directed—with their own goals and motivations. Hence a widespread fear that this could lead to a scenario in which AI systems develop their own consciousness and begin to act independently of human control. Thinking of AI as an extension of the corpus callosum may offer a powerful key to understand the potential of these systems and the challenges they pose. By seeing AI as an extension of our own cognitive abilities, we can begin to explore the ways in which these systems can enhance and augment human intelligence, rather than replace or undermine it.

We can also approach the development of AI systems with

a deeper understanding of the ethical and philosophical implications of these technologies, and work to ensure that they are aligned with human values and goals. Ultimately, the idea of AI as an extension of the corpus callosum invites us to reflect on what it means to be human, and how we can use technology to enhance our capacity for knowledge, creativity, and understanding.

### Me, My-Selfie, and I

Today, we are living in an age of transition driven by imperfect technologies that still force us to keep one foot in the real world and the other in the Metaverse. We will look very silly to future generations when they see pictures of us dealing with current technologies by texting, touching screens, and handling physical devices. All of this will disappear in a few years.

The real world and the virtual world currently operate independently. In the future, we will integrate the two by developing a huge corpus callosum of interconnected people and objects. Information will flow back and forth—as it does between the brain’s hemispheres—thereby merging the two.

Let me return to Marshall McLuhan. He says, “The extension of one sense alters the way we think and act—the way we perceive the world. When these ratios change men change.” It would be a mistake to think of the future as merely a sequence of changes in the way we live and work, driven by the development of technology. As we are entering this new age, our perception of the world and of everything in it will change. I know it’s hard to comprehend, so let’s look at history to explain what McLuhan was talking about.

A long time ago—five millennia or so—people on the banks of the Nile in Egypt and the Tigris and Euphrates in Mesopotamia began writing down words using hieroglyphs and cuneiform. The development of writing marks the delineation between historic and prehistoric times, and it represents a milestone in human development as tumultuous as the invention of the wheel or

the discovery of ways to ignite and harness fire.

The invention of writing expanded the way humans could communicate, but it did much more than that. It altered the fundamental relationship of human beings to their environment. In pre-literate times, people obtained information from all around them. Survival depended upon it. They used their sense of sight, sound, smell, and touch. The horizon looked like a circle around them; they were capturing information from 360 degrees. This is why, in pre-literate cultures, people tended to live in round dwellings—igloos, tiki huts, hogans.

With the arrival of writing, information came to them in a linear manner—at least to the literate and educated classes, who are so important in the shaping of society. In these literate cultures, writing was set down in straight lines. In the case of Egyptian hieroglyphs, the lines could be written from left to right, right to left, or top to bottom.

Writing (and reading) was an extension of the senses. Did it alter the way they perceived the world? Yes—buildings became square or rectangular. Today, we marvel at the Pyramids of Giza and the great temples up and down the Nile. These immense structures are testaments to the Egyptians' architectural skills and organizational abilities that harnessed the energy of tens of thousands of people in their construction. But the Pyramids, with their square bases, and the temples, with their rectangular designs, are also testaments to the literate nature of ancient Egyptian society.

In the Western Hemisphere, we can look at the dwellings of the pre-literate Plains Indians—the tepee—and see that it is round at its base. In contrast, Meso-American Indians had a form of hieroglyphs, and we can see the square and rectangle in their architecture, particularly in the pyramids that were central to their culture.

The linear nature of architecture that developed with literacy did not take place because of conscious decisions on the part of the builders. Architects didn't wake up one day and declare, "Aha—now that our society is literate, we will start build-

ing in squares and rectangles!” The process instead was subtle and took place without people recognizing why. The change from oral communication to written communication altered the ratios in people’s sense perceptions, and as McLuhan noted, “When these ratios change, men change.”

Welcome to the dawning of a new age. Tomorrow, we will live in a world not only influenced by writing, but also by the connection of virtual and physical spheres. When physical objects become virtually connected, it will be possible to merge and blend real and virtual worlds to produce a hybrid reality; where physical and digital objects coexist and interact in real-time. And this extension of all our senses will drastically alter the way we think and act—the way we perceive the world.

My advice is to start thinking hybrid. We first moved from analogical to digital—or from atoms to bits, as MIT graduate and faculty member Nicholas Negroponte said. He correctly predicted that the change from atoms (which are material and have mass and therefore must be physically transported) to bits (which are immaterial and weightless and allow for instantaneous movement) was inevitable. After going digital, we then moved from fixed to mobile media. These two switches changed the way we think and act. The next step will be moving from digital to “digital” and Experience Reality—implementing virtual and augmented reality into the real world.

When hybrid reality reaches its perfection—and it will take some time for this to happen—the virtual world will be included seamlessly in our own little perceptual bubbles. And we will make decisions based on a whole new set of inferences. Fortunately, the neocortex in the human brain is evolving at a prodigious speed. Our perception of the world will be different because we will see things that we couldn’t even imagine before.

Let’s look at a habit that we have established recently because of the development of a new tool. The camera in our smartphones acts as an extension of our eyes. And what do we do with it? We take selfies—and a lot of them! It’s easy to make fun of the

preoccupation with selfies, and many of us do. But let's look at them from a historical perspective.

Some of the most admired works of art from the Renaissance and early modernism are self-portraits. From Leonardo to Dürer to Van Gogh and his self-portrait with a bandaged ear, painters have loved capturing images of themselves on canvas. Rembrandt alone painted nearly forty self-portraits.

An intriguing aspect of self-portraiture, however, is that it didn't exist as an artistic practice before the year 1400. People painted landscapes, royalty, and religious scenes, but they didn't paint themselves. Why? Because self-portraiture had to wait for the perfection of a tool, a new medium that expanded people's perception. The mirror became an extension of our eyes and brought the image of "self" inside our perceptual bubble.

Now try to imagine what is going to happen when not just mirrors, cameras, and linear writing enter our sphere of perception, but entire virtual and augmented worlds through hundreds of billions of connected objects. We'll perceive, understand, learn, think, and act "digically"—as I said, the neologism "digical" is a cross between the words "digital" and "physical."

Now You See It, Now You Don't  
—A Digital Vanishing Act

AI clouds—triggered by the advent of high-speed networks—will cause a proliferation of IoT smart objects. So the two great changes of the next decade will be the "smartification" and the "vanishing" of objects—yes, I coined these names too.

Smartification will be the redesign of the objects surrounding us to make them connected and smart. And vanishing will happen when the objects born of the Industrial Revolution slowly start to fade away and disappear.

Think about it. A song could only be listened to live until Thomas Edison patented the phonograph. And then came records. From having one phonograph and only a handful of records to

entertain a public audience, we moved to having one phonograph per family. It was in the living room, remember? Then one device per person—and those devices were mobile—when 8-tracks, tapes, and CDs were each introduced. And millions of these sold. It was the Industrial Age at its best. But then came Steve Jobs with iTunes and iPods, and the physical CDs started their vanishing process (as had each of their predecessors) in favor of the digital distribution of music.

Time was originally measured by the pointer of a sundial. And then the sand in an hour glass. Followed by clocks. First it was one clock per village (on the top of a tower), then a clock in each home, and finally one watch per wrist. But then eventually the progressive vanishing of watches began, as the time of day was now digitally displayed on cell phones—and in televisions, dashboards, appliances, and everywhere else imaginable.

Similarly, compasses and maps were taken over by GPS devices such as TomToms. Now we have both in our smartphones. So what happened to the entrepreneurs manufacturing and distributing all of those record players, tapes, CDs, clocks, watches, compasses, maps, and GPS devices? They were bankrupted or they merged—in a word, disrupted.

As an example, let's have a look at what happened with TomTom. In 2000, then-President Bill Clinton declassified much of the United States' GPS data and unknowingly killed the map-making industry. Free internet sites for route directions, such as MapQuest and Yahoo Maps, entered the market and navigation-products like TomTom and Garmin suffered as a consequence. Within two years, the Google Maps Navigation cellphone app took over the market. Garmin lost 70 percent of its market capitalization and TomTom lost nearly 85 percent. They simply couldn't compete. Google Maps had better performance—it updated by itself, and best of all it was free! Nobody could resist and everybody migrated. A connected digital service all but killed standalone physical navigation devices.

The same thing happened with digital image technology,

which killed consumer photography and the film manufacturing industry. All of these objects have one thing in common: all of the killers were connected and soon to be “smartificated,” while all the victims were stand-alone and physical.

This is only the beginning of the vanishing. Smartphones will disappear too. Ironically, it will be our own voices that will kill the smartphone. We already talk with Siri, asking it questions and giving it commands. It calls people for us, and we leave them voice messages. It tells us directions while we are driving, allowing us to safely dictate texts. We even buy goods with vocal instructions. Tapping a screen is so very 2010s.

When using voice becomes common practice, what do you think will happen to screens? They will slowly start to disappear and become add-ons to be projected into the air when (and if) we really need a surface to watch a video on. Hence, smartphones will disappear into hearing devices that will be built into everything, from the eyewear on our faces to the buttons on our clothes, watches, and jewelry. Remember what happened to our watches, when the time began to appear on our mobile phones, appliances, and car dashboards? Same thing.

Laptops will also disappear—and wearable computers will take their place. All the current devices will move into smart appliances, smart clothing, and even into our bodies. Some of them will be inside of us, such as retinal implants. Others will be attached to us, such as contact lenses with a visual interface, for instance. We will not need Google Maps anymore as we will have embedded sub-dermal GPS tracking biotech. Eventually even our thoughts will be converted in electrical signals, communicating silently with smart objects, wearables, and robots. Telepathy will be the ultimate user interface. Not so fast though—in the meantime we will go through a wide variety of creative solutions that will get us there, such as watches and glasses, gloves and rings, pins and bracelets.

Now, don't make the mistake of thinking that this disruptive wave will impact just information-based goods and services. It will affect every aspect of our lives. For example, IoT smart

objects will never replace food, but stores will gradually become experience and demonstration sites. They will no longer exist for the storage of goods but instead will provide us with 3D Printing for instant manufacturing or with drones for instant delivery.

The best piece of advice I can give you regarding the competition of the next five to ten years is this: move to AI and integrate emerging technologies. Do it for every aspect of your business. This includes client relations, logistics, distribution, and the integration of production processes. Organize yourself immediately so as to gain the ability to remotely manage your business in real-time.

Do it now! Forget about everything else and concentrate on this. The rest will take care of itself along the way, but AI and emerging tech will be the difference between who comes out on top and who is left behind.

First to disappear will be codes. Let me tell you a story.

### The Mystical Gateways of No-code and Low-code

Imagine you stumble upon a magical realm where the art of coding transforms into a whimsical dance of wizards and spells. In this enchanting world, anyone can conjure powerful computer systems without needing to wield the knowledge of coding. This fantastical reality emerges with the rise of no-code and low-code applications, akin to wielding a wand that brings digital dreams to life.

Now, imagine you are a wizard in that mystical realm and you want to create powerful spells to bring your ideas to life. In the past, mastering the art of spell-casting required years of studying ancient texts and memorizing complex incantations. But now, with the rise of no-code and low-code applications, you possess a magical wand that allows you to create extraordinary spells with a wave and a flick!

In this magical realm, the no-code and low-code platforms are like enchanted spell books. They are filled with captivating

spells ready to be cast. Instead of laboriously learning each spell's intricate details, you can simply choose the ones that resonate with your vision and combine them effortlessly.

To illustrate this magical concept, let's say you want to create a potion to bring happiness to people. In traditional spell-casting, you would have to gather rare ingredients and carefully mix them in precise proportions. But with a no-code or low-code platform, you can summon a pre-made happiness potion spell, customize it with the ingredients you desire (like joy, love, and laughter), and unleash its magical effects with a tap of your wand. The platform handles all the intricate potion-making details for you.

Similarly, let's say you want to create a spell that brings dreams to life. In the realm of no-code and low-code, you can choose a pre-enchanted dreamscape spell, customize it with your desired elements (like clouds, rainbows, and unicorns), and activate it with a gentle command. Your spell will weave a mesmerizing dream world without you needing to delve into the complexities of dream crafting.

No-code and low-code applications are like magical talismans that will make you a wizard capable of conjuring extraordinary creations, even if you have no expertise. They provide a mystical interface that allows you to shape your imagination into reality effortlessly. In this magical realm of technology, no-code and low-code applications have cast a spell of accessibility and inclusivity, allowing everyone to tap into their inner wizard and bring their digital dreams to life. By eliminating the need to decipher intricate spell books, no-code and low-code applications make magic accessible to all. They unlock the wonders of creation for sorcerers, enchanters, and artistic beings, enabling them to manifest their ideas swiftly and elegantly.

In the coming years, something called "no-code" and "low-code" applications will become more accessible. These applications allow innovation teams within companies to create powerful systems for decision making, business analysis, and coming up with new product ideas. This means that teams will

have the tools to be more efficient and creative.

Now imagine a marketing team that wants to analyze customer data to make better decisions. With a no-code platform, they can easily create a system that collects and analyzes data from various sources. This system can help them understand customer preferences, identify trends, and make informed marketing strategies. Or a design team in a manufacturing company. They want to generate different prototypes for a new product. Instead of manually creating each prototype, they can use generative AI, which is a form of AI that can come up with new ideas and designs. With a few prompts or inputs, the AI can automatically generate numerous prototypes, saving time and increasing the chances of finding the perfect design.

As these technologies become more widespread, they will lead to hybrid teams of humans and machines working together. The AI systems will assist humans in decision making, increasing efficiency, and fostering creativity.

To make the most of these advancements, it is important for leaders, especially chief strategy officers, to understand AI and its implications. They should collaborate closely with other executives in the C-suite to develop a unified perspective that will help in developing strategic plans that incorporate AI technologies effectively—and be very careful not to forget the emerging technologies that will form the AI Ecosystem. It will be a huge change; some have started to call it Metaverse. There is nothing to be scared about though, as humanity has gone through the same kind of changes many times. Let me start from the beginning, literally.

### The Great Break

Fifty million years ago, the Earth was characterized by high levels of carbon dioxide and unbearably hot temperatures. The snowy northern wilderness that we know of today as Alaska, would have more closely resembled the swampy crocodile-filled

subtropics of Florida. But over the next 15 million years, carbon dioxide levels began to drop and temperatures began to cool. At the same time a meteor exploded.

These abrupt changes in atmosphere and climate led to numerous changes in plant and animal life as well. As creatures adapted and evolved at the beginning of this era, countless new species came into existence. Scientists refer to this time period as the Eocene Epoch, which in Greek means “a new dawn.” However, the flourishing of new life which occurred at the dawning of this era ended in a sudden mass extinction, known as “The Great Break.” The animals that remained after this were, by and large, the animals that still populate our planet today.

It was during this time that the ancestors of modern monkeys and apes—and humans—first came onto the scene. These primates began transitioning from nocturnal to daytime life, changing their diets and growing larger brains. Then a genetic mutation occurred. They lost their two-dimensional ultraviolet vision, and in its place evolved the three-dimensional vision common to all mammals today. And so, primates acquired the ability to detect red fruits against the background of the green forest. They were better able to hunt, as well as to avoid predators and to mate.

Evolving to 3D color vision is part of what allowed our primate ancestors to evolve and was a factor in helping humankind to win the animal race for supremacy. And now we are evolving again. This time from 3D vision to a 4D vision. How?

We are evolving to hybrid vision, exponentially expanded. We are almost there. It will only take one more small step in technological advancement—but it will be a giant leap for mankind. In a few generations, we will have forgotten how it was before, in the same way that nobody today rides on a horse to get from point A to point B, hops on a steam boat to travel, or dials a rotary phone in a cabinet to call someone.

Augmented Reality (AR) and Virtual Reality (VR) will be taken over by Experience Reality (MR), which will include both of them, as well as the real world. I refer to it as MR myself, as do



As you can see in the graphic, I described this reality as “seamless,” but what does that mean? Seamlessness is the peculiarity of being smooth and continuous—without gaps, spaces, or obvious connections between parts. The world of the future will flow between physical and digital with no interruption of continuity. For this world I coined the neologism “digical”—a cross between the words “digital” and “physical.”

How is this kind of continuity possible? Today, there are more than 100 billion microprocessors, but only one in a thousand ends up inside a computer. That’s right—only 0.1 percent of microprocessors are used in computers, and the other 99.9 percent are used in other objects. That can’t be right, you may think. But I encourage you to think again. Think about the computers you have in your own home. You may have a laptop for personal use, and one for work as well. Perhaps your partner does too. And maybe your children share a family desktop computer for doing their school work on. Four computers per household sounds like a reasonable estimate.

Now think about the other electronic and digital devices you have in your home. You probably wake up each day with an alarm clock, start a pot of coffee, pop your breakfast in the microwave, listen to the morning news while you get ready, adjust the thermostat before you leave the house, and open and close the garage door with a remote. Just like that you’ve already used half a dozen devices containing microprocessors, and you haven’t really even started your day yet.

If we keep counting as you continue your commute to work, that number becomes even more impressive. Your car could have as many as fifty microprocessors in it. Where are they all hiding? They could be in your headlights, mirrors, anti-lock brakes, airbags, and any number of other components. Microprocessors are everywhere, but although they surround us at every turn, most of us would be hard-pressed to point them out. We simply take them for granted. They are utterly ubiquitous and will only continue to become even more so as we move into the future.

The vast majority of future microprocessors will be inside of all sorts of physical, everyday objects. With a processor inside, these objects will be able to process data. And with a radio frequency to allow wireless communication, they will be able to share that data with other objects and with us. It's really quite simple. We're already doing it today with our cellphones and Wi-Fi.

It is true that more is still needed. The objects are not yet smart enough since they do not know what's happening around them. An object does not possess what we have: senses. It cannot see, hear, taste, smell, or touch. But we can equip it with "computer vision" and other sensors that will allow it to perceive the reality surrounding it even better than we do.

These smart objects will change our perception of the world. Why? Until today, the digital and the physical have been two worlds apart. We as humans have primarily inhabited the physical world, and until now, have only been able to access the digital world through devices, such as computers and smart phones. However, when physical objects become digitally connected, it will be possible to blend real and virtual worlds to produce a hybrid reality—one where physical and digital objects coexist and interact in real-time.

### The Reality-Virtuality Continuum

Five years from now, all the technologies dealing with alternative realities—such as Virtual Reality (VR), Augmented Reality (AR), and Immersive Reality (IR)—will converge into Experience Reality (XR), or what is sometimes referred to as Mixed Reality (MR) or hybrid reality.

Over the years, I've noticed that the difference between Virtual Reality and Augmented Reality is not always clear to everyone, so let me take a few lines to define these terms, and then we will get back to Experience Reality.

Virtual Reality is an immersive computer-simulated environment. The virtual yellow line marker on live television NFL

games is a good example of Virtual Reality, and so too are NASA flight simulations. The worlds in the movie *Inception* are another. If we were able to see the virtual yellow line markers live at the stadium, or if the protagonists of *Inception* were able to interact in their virtual worlds while awake, then that will be Extended Reality.

All the video games played with a Head-Mounted Display (HMD) are played in Virtual Reality. The HMD is what alternative realities have in common and is the foundation of interacting in a reality different from the physical world. Fifty years ago, the American computer scientist Ivan E. Sutherland (considered to be the “father of computer graphics”) invented the first HMD system, giving birth to Augmented and Virtual Reality—but he didn’t know it yet. The term “Virtual Reality” coined by Jaron Lanier and the term “Augmented Reality” coined by Boeing researcher Tom Caudell, wouldn’t exist for another twenty years or so still. But from that moment onward, virtual and augmented realities became separate—although connected—industries.

In 1991, Virtual Reality devices became accessible to the public through arcade machines and immersive stereoscopic 3D visuals. From then until now, Virtual Reality has been used mostly for games and flight simulation. The computer-simulated environment in which one or many users live and interact is largely what defines Virtual Reality. Virtual Reality is a 3D computer software program that replicates a real or imaginary environment, simulates an immersive interactive presence displayed with a Head-Mounted Display, and is controlled by the movement of the body. Using advanced technologies such as haptic systems, it may also include tactile information. A good example of a Virtual Reality application is Oculus Rift, an HMD for gaming purposes developed by Oculus VR, a company acquired for \$2 billion by Facebook in 2014. In Virtual Reality environments, we cannot see the real world, as it’s replaced by the virtual one we are immersed in.

Until today, Augmented Reality has been used mostly for geo-mapping, flight and drive simulation, and technical assistance

for construction and repair. Augmented Reality is a live view of the real-world environment, although our perception of it is enhanced (augmented) in real-time by superimposed information, such as video, graphics, or data. The information can be interactive and digitally manipulable through advanced technology such as computer vision and object recognition. One good example of Augmented Reality is a helmet for construction workers that displays how-to information about construction sites. And one unfortunate example of augmented reality is the Google Glass.

The discipline including these different realities is called the reality-virtuality continuum. It's a continuous scale ranging between the entirely virtual and the entirely real, encompassing all possible real and virtual objects. Between the two extremes, there is a portion of the continuum where both the real and the virtual are mixed, and this is the Experience Reality.

### Experience Reality

Experience Reality is a mix of AR and VR. Unlike AR, where virtual objects are simply overlaid and made to appear in our physical world, with Experience Reality, these virtual objects are anchored to our physical world and able to be interacted with. It scans our physical environment and then maps out a 3D representation of our surroundings. This means that our device has information about where and how computer-generated elements are placed in the space around us. Experience Reality is not immersing the user into a different world, as VR does, but into an enhanced environment where the user can easily move through the real and virtual worlds simultaneously.

Experience Reality is the language of the “digical” world, and it's the future of perception. Remember Marshall McLuhan? He said, “The extension of one sense alters the way we think and act—the way we perceive the world. When these ratios change, men change.” The question is how will we change? Let's ask Henry Markram to help us to understand how the brain works.

Professor Markram is a brilliant neuroscientist and the director of Blue Brain, a supercomputing project that can model components of the brain. He theorizes that the brain creates its own version of the universe and projects it like a bubble all around us. “The reason why the moon is huge on the horizon is simply because our perceptual bubble does not stretch out 380,000 kilometers. It runs out of space,” says Markram. “What we do is compare the buildings within our perceptual bubble and make a decision, ‘it’s that big,’ even though it’s not ‘that big.’” Decisions are the key. They keep us alive. Without decisions we cannot see, think, or feel. In the same way, Experience Reality changes the perception we have of the world and projects it like a bubble all around us. It will happen without—or with the least possible—intermediaries.

What makes Experience Reality so special? Let me share a couple of examples. Nearly everyone does at least some of their shopping online, even though it is nothing like going to a store and sometimes we miss the experience. Say you are shopping for a dress. In the store, you can choose a dress by trying it on first, but you cannot do the same online. Experience Reality will allow you to virtually try on that dress, move around, and see yourself in it from different angles. It’s all about the experience, and that’s why Qualcomm has started to call this technology eXperience Reality (XR). Now imagine how Experience Reality will transform manufacturing facilities as workers visualize and interact with virtual objects and augmented views of instructions while they manufacture goods. Or imagine being “holoported” (virtually transported by hologram) to talk to relatives or business partners who are far away.

Let’s not forget that Experience Reality includes physical reality. Physical location will impact the experience. Location-based centers will be established in the near future to provide a better viewing experience for visitors in entertainment and educational places like museums, amusement parks, and retail stores.

Video games and then movies will incorporate Experience

Reality—when this happens, we will be able to holoport into the movies and be a part of the story ourselves. Eventually, every single thing we do will be disrupted by the Experience Reality that will slowly replace mobile devices and TVs.

### IoT Smart Objects

The internet today is a worldwide network of computers, but the “Net” of the future will connect IoT smart objects to other objects and to people. This will drastically change the way companies deal with consumers. We’ll buy fewer products and more services. Among other things, we’ll download programs and utilities that will customize objects, just as we update our computer software today. Physical objects and mechanical parts will still be sold, but they will have digital layouts that will allow us to easily modify them to our specifications.

We don’t need to buy high-performance vehicles just to drive back and forth to the office or the supermarket. In the future, when you’re getting ready to go on a vacation somewhere that is hundreds or thousands of miles away, you might be able to download more horsepower into your vehicle and take off. You might pay \$200 to buy fifty more horsepower for the month. And maybe for another \$50, you could change your car’s exterior from a boring midnight blue into a cheery sky blue with yellow dots, because the paint would incorporate nanotechnology designed to modify the color. And these downloaded features would last only for the duration of the trip.

In May 2013, I was a keynote speaker at the Deloitte Global Financial Services Industry Summit in Paris. The theme of the event was “Elements for Successful Growth.” In my speech, I used for the first time the neologism “digical” to describe a brave new world made of a totally new generation of products—billions of connected smart objects interacting not only with people but also with other smart objects. Since then, I’ve been talking about the digical world in every speech I’ve given because I really be-

lieve that digical is going to be the key element for the successful growth of businesses, markets, and economies. And I also believe that it will enable a higher quality of life for all of us.

What do I define as a digical object? A digical object has the properties of “understanding”—sensing, interpreting, and reacting to—events and human activities that occur in the physical world and of “interacting” with the user, the context, and other smart objects in terms of input, output, control, and feedback. It is reconfigurable and has local control of the resources needed (such as energy and data storage). A digical object can be designed to be “intelligent” through the implementation of AI properties such as learning, problem-solving, knowledge representation, and planning. It’s a thing existing in both the digital and physical world—the combination of a tangible object with sensors, actuators, mobile connections, and computing capabilities. Sensors, actuators, mobile connections, and computers are all existing technologies, but they are being blended in ways that will allow old physical objects to perform new tasks.

There are many other names for digical objects. They are also called “tangible user interfaces” or “smart things”—as in the Internet of Things (IoT). In this book, I refer to them as IoT smart objects, but you can keep calling them whatever you are used to. There is neither a correct nor incorrect way to refer them. In reality, all of these terms have come into existence quite recently.

In the early 1990s, the term more commonly used was “ubiquitous computing,” which was coined by Mark Weiser. Weiser wrote, “When almost every object either contains a computer or can have a tab attached to it, obtaining information will be trivial.” Then in the early 2010s, the term “Internet of Things” became more popular for describing these everyday objects that could now connect with, understand, and interact with the environment, humans, and other smart objects. And since 2013, I personally have referred to them as “digical.”

It all started with a Coke machine at Carnegie Mellon University’s School of Computer Science. Admittedly a vending ma-

chine does not seem a likely candidate to become the forerunner of the IoT. So let me tell you its story, as it was told by the fellows at the Carnegie Mellon Computer Science Department.

Since the early '70s, there had been a vending machine in the computer science building that sold bottles of Coke for a dime—less than all the other vending machines around campus. As no real software programmer can function without caffeine, the machine had always been very popular. Urban legend had it that at the time its sales volume was the highest of any Coke machine in the Pittsburgh area.

The machine was loaded on a rather erratic schedule by grad student volunteers. In the mid '70s, expansion of the department caused offices and classrooms to be located even further away from the main terminal—the room where the treasured Coke machine stood. It became rather annoying to go down to the third floor only to find the machine empty—or worse, to receive a recently loaded, still-warm Coke. So one day, four graduate students got together to devise a solution, and inadvertently created the first connected smart object ever. Their names—Mike Kazar, David Nichols, John Zsarnay, and Ivor Durham—aside from this one achievement, are otherwise lost to history. They are the individuals who invented the IoT—all in order to check from their desks to see if a vending machine was loaded with cold Cokes.

They accomplished this by installing micro-switches in the Coke machine to sense how many bottles were present in each of its six dispenser columns. The switches were hooked up to the main departmental computer. Then a server program was written to determine how long each bottle had been in the machine, changing the display to “cold” after the bottle had been there three hours.

But how could people check the status of the vending machine Cokes when they were logged in on a machine other than the main departmental computer? The final piece of the puzzle was to create a nonexistent user named “Coke” in the ARPANET protocols (the first network, now the internet) so that people could

check the Coke machine from any computer with the command “coke@cmua” (CMUA being the departmental computer). Thus, they were able to discover the Coke machine’s status from any computer, anywhere on the internet—well... ARPANET, at that time. Not that it would do you much good to check on a Coke machine from a few thousand miles away... but it made the Carnegie Mellon’s Coke machine the first truly connected object in history. And thus, the Internet of Things was born.

The IoT will be the infrastructure of the digical world. It will be the foundation that underlies technologies such as smart grids, smart homes, intelligent transportation, and entire smart cities. In 2012, I forecast that connected objects would total 250 billion by 2025 with a potential business opportunity of \$25 trillion. This number includes every type of smart object or device—smartphones and iWatches of course, and also “heart monitoring implants, biochip transponders on animals such as clams and fish in coastal waters, smart transportation and self-driving automobiles, DNA analysis devices for environmental, food, and pathogen monitoring, and so many more than we can possibly imagine,” as Columbia University’s researcher Yaniv Erlich wrote in his book on the future of ubiquitous genomics. And this will be just the beginning. There will be three core sectors of the IoT: enterprise, home, and government. According to French nanotechnologist Jean-Baptiste Waldner, in a few decades, the Internet of Things will encode 50 to 100 trillion objects and be able to follow the movement of each and every one of those objects.

I agree with the theory that in the next five to fifteen years, most of the objects and devices will become “inextricable mixtures of hardware, software, data, and services,” as Ian Walden of Queen Mary School of Law defined them. This is similar to the way in which our everyday physical objects have become a mixture of textiles, wood, metal, and plastic as we have learned how to blend them together.

The best-selling IoT product twenty years from now has not been invented yet. The asset-light IoT business models that

will allow even small businesses to become micro-multinationals do not yet exist. We are at the dawn of what is coming.

### 3D Printing

Today, many things (including cellphones) are replaced rather than repaired. This is a recent occurrence. It started because production costs dropped to the point where it is often cheaper to make a new object than to fix an old one. If a shirt tears, we throw it away and go shopping. Menders are a disappearing breed, but not too many years ago shirts were still sold with replacement cuffs and collars.

In the future, there will be many objects that we'll use only once because technology will allow for low-cost manufacturing in homes for small, simple products. We already use disposable tissues and napkins, plastic cups, and paper plates. In the future we'll have our own home manufacturing machines that will make these and other objects using algorithms. We'll buy and download the algorithms online and produce the products at home. "Impossible," you say? Think of IKEA, which moved the assembly process from its factories into our homes. That was the secret of IKEA's success. For you, the secret to business success might be 3D Printing.

First of all, what is 3D Printing? Well, it's exactly what it sounds like it is—employing a printer to create real three-dimensional objects. This manufacturing process is executed using computer-aided design. Much like a two-dimensional printer that places a layer of ink on top of a sheet of paper, the first generation of three-dimensional printers used inkjet printer heads to deposit a binder material onto a powder bed, one layer at a time. The difference, however, is that the 3D printer repeats this process over and over, building successive layers of the product until a three-dimensional object is created. Recently, a wider variety of 3D manufacturing techniques have been patented, but they all have one thing in common: 3D printing is an "additive" process, which al-

lows us to create objects one layer at a time. This is the opposite of traditional manufacturing processes which are “subtractive” and involve cutting down raw materials and assembling them.

Until today, 3D Printing has been used mostly for smaller applications—creating prototypes, manufacturing replacement parts and special components, and producing human tissue replacements and implants. However, it is possible to use 3D printers for much larger applications. Producing bigger objects would simply be a matter of having bigger printers. In fact, an entire building was just recently 3D printed in Dubai.

There are countless other applications for this technology in every industry imaginable—architecture, construction, industrial design, automotive, aerospace, military, engineering, fashion, footwear, eyewear, education, geographic information systems, and the list goes on and on. These applications are currently possible, and they are the talk of the manufacturing business community. But let me point out what very few seem to see in the evolution of 3D Printing. It’s what I call the “ToI.” Before I tell you about the ToI, let me point out two things that we should be careful not to underestimate.

First of all, we must realize that there is no limit to what objects can be 3D printed. More advanced printers will enable the production of digital objects—microchips, data processors, sensors, actuators, and connections that can be integrated in the IoT. Secondly, we should realize that there is no geographic barrier to how objects can be 3D printed. The whole premise of this technology was to foster creativity and change in product design. It was originally conceived as a designer application to prototype from CAD applications, but this is changing. In the future we will manufacture the objects we need right at home, downloading the algorithms from the internet. It will be the reverse side of the IoT—the ToI. The next generation of smart objects will be the Things of the Internet. And it will be a paradigm shift for the manufacturing industry.

## ToI: The Things of the Internet

The logical next step is home manufacturing, and here is an example. Instead of a washer and dryer, we'll own a new machine, perhaps half the size of a closet. At the end of the day, we'll throw our dirty clothes into it. Instead of washing them, the machine will break down the dirty clothes into microfibers and the buttons into plastic, for reassembly. The next morning we'll wake up and decide what kind of shirt we want to wear. We'll make it white, or yellow with red stripes if we're feeling bold. We'll choose a button-down collar or a crew neck. We will pick what we want from a catalog of algorithms. If we're fashion-obsessed, we'll download an Armani or a Versace algorithm—no doubt at a premium price.

The same thing will happen with dishes, chairs, tables, and lamps. We'll make them in our homes to suit our tastes. When all of us and all of our smart objects are connected, our homes will also be our offices and our factories.

There are some limits to 3D Printing though, such as material properties, speed, and the quantity of things that can be produced. But 3D companies are constantly pushing those limits, year by year. And there is a plus that no other technology can claim—one that is more important than saving energy, providing flexibility, and reducing materials used. 3D Printing will finally enable mass customization. It will be the Sorcerer's Stone of future business, allowing one-to-one manufacturing of zero-mile goods.

I absolutely agree with what economist Jeremy Rifkin wrote about 3D Printing.

“While the Third Industrial Revolution allows millions of people to produce their own virtual information and energy, a new digital manufacturing revolution now opens up the possibility of following suit in the production of durable goods. In the new era, everyone can potentially

be their own manufacturer. 3D printing requires as little as 10 percent of the raw material expended in traditional manufacturing and uses less energy than conventional factory production, it will greatly reduce the cost. The energy saved at every step of the digital manufacturing process, from reduction in materials used, to less energy expended in making the product, when applied across the global economy, adds up to a qualitative increase in energy efficiency beyond anything imaginable before. As the new 3D technology becomes more widespread, on-site, just in time customized manufacturing of products will also reduce logistics costs with the possibility of huge energy savings. The cost of transporting products will plummet in the coming decades because an increasing array of goods will be produced locally in thousands of micro-manufacturing plants and transported regionally by trucks powered by green electricity and hydrogen generated on-site.”

3D Printing is growing at an astonishing rate, despite initial skepticism. Want an example? On July 16, 1984, Alain Le Méhauté, Olivier de Witte, and Jean Claude André filed their patent for a 3D printed through stereolithography. Three weeks later, Chuck Hull filed his own patent for the same type of stereolithography. So why is Hull known as the American engineer who invented 3D Printing and the Frenchmen are not? Because the application of French inventors was abandoned by the French General Electric Company “for lack of business perspective.” Thirty years later, in 2015, 3D Printing was worth \$5 billion annually, and the consulting firm McKinsey & Company has forecast that it will have an economic impact of \$550 billion annually by 2025. That’s a sudden leap of 1,100 percent in ten years.

## Cloud-Connected and Cobots

Cloud-connected robots can communicate with each other

and work together to achieve tasks that we assign remotely. These robots will use predictive analytics to detect possible problems—such as when their own components are likely to fail—so that issues will be fixed before major shutdowns.

Collaborative robots (also known as Cobots) will perform tasks that require close coordination with humans. Usually small, quick, and light in movement, these robots are the next generation of assembly line robots, provided with built-in safety features that will stop them whenever they bump into a human.

In the next few years, there will be a sudden increase in the implementation of AI in manufacturing. Hyper-connectivity, Artificial Intelligence, and Cobots will transform industrial production. Driven by these three technologies, I expect this new wave of manufacturing to create \$4 trillion in value by 2025.

IoT devices will play a big role in this. The tech industry is already working on almost one thousand IoT platforms for industrial use, and major technology companies are investing heavily in hyper-scalable IoT platforms. Almost 10 billion devices are already connected, yet only one out of six assets is connected in production. And no more than 0.5 percent of their collected data is used to make decisions. We have a long way to go still, to reach the full potential of AI in manufacturing.

Collaborative robots will turn current geoeconomics upside-down and become the catalyst for shifting manufacturing away from third world countries. They will become essential for security and for factory automation. But they will not just be standing in for humans in factories. They will also play vital roles in waste management plants, power plants, construction sites, fully automated warehouses and distribution centers, and entire supply chains.

There have always been many prejudices against the use of robots, but the Coronavirus pandemic has changed this. It has forced people to keep their distance from one another, thereby promoting the use of hospital robots to safeguard the health of doctors and nurses. We were not ready for the Coronavirus pan-

demic, but in any future health crises, we will already have robots collecting nasal swabs and using ultrasounds to locate veins to draw blood for tests. Convincing people it's safe to let a robot stick a swab up their nose or jab a needle in their arm was a hard sell before the Coronavirus, but the emergency has lowered the level of bias and given robots a chance to prove their usefulness in the management of repetitive and mechanical activities in health-care and medicine.

Robots will increasingly play important roles in areas like disease prevention, diagnosis and screening, and in a variety of other activities such as taking patients' temperatures, disinfecting hospitals, collecting patient samples, automating lab tests, and delivering drugs. Thermal cameras combined with image recognition algorithms have already been put in place to detect potential cases at places like airports, and in the future, they will be incorporated into mobile robots or drones to facilitate constant screening programs.

During the lockdown, the increase in online sales has been strongly supported by robots managing warehouses and distribution centers. The companies that have equipped their warehouses with robots are now switching all the simple jobs, like order picking, to robots. In the future, robots will not only work behind the scenes to stock shelves, but they will also serve customers and deliver products to our doorsteps. The Coronavirus emergency has also accelerated the use of delivery drones—which have now been given the green-light in China. The future of delivery drones will depend on whether or not regulators will eventually allow drone companies to have autonomous systems in which multiple aircraft are overseen by one pilot, and whether or not they are allowed to fly beyond the vision of that pilot.

### Wearing Our Technology on Our Sleeves

It's not just our cars and household objects that will be connected in the future. We ourselves will be connected too. To

make this possible, devices will be put on and worn, embedded in our skin, and ingested by our bodies. This may sound far-fetched, but the rapid rise in popularity of wearable devices (and the slow decline of hand-held devices such as smartphones) testifies to this fact.

Modern wearables started in the '80s with the digital calculator watch. Then came the smartphone (a huge leap indeed) and everything changed. Eventually, came the wearable fitness devices such as the Nike+ in 2006 and the FitBit in 2009—devices that track the calories we consume and burn, measure our heart rates, and count our steps. Surprisingly, companies stood still for a while, for fear that sales would not be worth the cost of launching new wearable products, which were perceived to be nothing more than gadgets. They should have trusted their consumers more. On May 18, 2012, the Pebble smartwatch crowdfunding campaign closed on Kickstarter. The creators were looking for \$100,000 and they raised \$10 million instead. The first \$1 million was raised in twenty-eight hours and a new trend began.

While this trend is new, the concept is certainly not. As modern as these devices may seem, they have their roots far back in history. All the way back in 1472, Leonardo da Vinci had already conceived of the notion of a pedometer, as evidenced by records found in some of his sketches. Of course, the technology did not yet exist to bring his invention to life, but the idea was there. By 1788, however, Thomas Edison had figured out how to turn the idea into reality by borrowing from the technology used in the motion-sensitive watches that were available in his day. Although the popularity of the pedometer did not catch on until much more recent times, the vision that brought these devices to life predated them by centuries.

We can trace the existence of other wearable devices back through history as well. When computers came on the scene in the 1900s, these were also made wearable. In 1961 Edward Thorp and Claude Shannon invented a computer small enough to fit inside of a shoe—with the purpose of using it to cheat at gambling. This

computer could predict where the ball would land in a game of roulette and increased the wearer's odds of winning by 44 percent.

In the decades since then, technology has continued to increase in complexity while decreasing in size, and this has caused the popularity of wearables to soar. They are no longer novelties, but commonplace items. More than a thousand different types of wearable devices exist today—embedded in watches, earbuds, and many other objects. Worldwide, smartphone sales are on the decline, and wearable sales are on the rise. In the next ten years, we can expect to see the trend move away from carrying a single device and toward wearing and commanding a whole suite of devices instead.

Imagine shoes that not only can count your steps, but also can track your weight, while simultaneously heating and cooling your feet to keep them comfortable. Or a shirt that can monitor your physiology and use it to analyze your mood, and then change color to broadcast your current state of mind to those around you so they know how to best approach you. Or what about microchips that are embedded in nail polish which allow you to control virtual screens like something out of the movie *Minority Report*. These things might sound far-fetched at the moment, but the technology required for these types of wearables is already in development, and in many cases, even already in use.

Take connected eyewear as an example. Companies like Apple, Amazon, Facebook, Google, and Microsoft are all currently making connected devices that you can wear over your eyes. By projecting images nearer to our eyes (while making them still look as if they were farther away at the appropriate distance) these glasses will prevent the strain on our eyes that is normally caused by constantly attempting to focus them on objects at a distance. These glasses will also provide us with the possibility of experiencing Augmented Reality. Through them, you would see your actual physical environment, along with virtual objects projected into that environment, which will move and interact inside that environment, indistinguishable from the real objects. Want to re-

decorate your office more to your tastes, but your company has strict policies against that? Go ahead and hang those posters—virtually. Want to make your kid’s dream of a pet dinosaur come true, but you don’t have the remote island or prehistoric DNA you need to recreate Jurassic Park? Go ahead and download your little one their very own Velociraptor, which they can (safely) see and interact with.

The applications of connected glasses will extend far beyond the enjoyment of consumers, however. In fact, the more practical business applications are the ones that will become fully developed first. These glasses are already being used by some companies. Warehouses and manufacturers are using these devices to take countless pictures hands-free, for the purpose of collecting and analyzing their processes, products, and data. Hospitals are using these glasses to provide information in real-time to doctors, displaying patient charts literally right in front of their eyes, and thereby reducing the likelihood of dosing the patient with the wrong medication or accidentally overlooking a life-threatening allergy. Other businesses are using them for purposes like displaying notes to glasses-wearing audience members during training presentations, or for giving instructions to employees throughout the day.

# BECOME AI-FRIENDLY, STEP-BY-STEP

## The Exponential Effect

In 1998, I had the pleasure of dining with Nobel Laureate Lawrence Klein. I had just forecast that digital applications were leading to an integration culminating in many-to-many platforms. When I told him about my theory, he seemed genuinely interested. But Lawrence was an extremely kind person, so I assumed that he was simply being courteous. You cannot imagine my surprise when, back home in Pennsylvania, he wrote to me that he had found “an astonishing resemblance” between my model and an idea he had started working on for the integration of the various European currencies into the Euro.

Let’s fast forward. It’s 2015, and the author of *Digital Darwinism*, Tom Goodwin, writes in *Tech Crunch*, “Uber, the world’s largest taxi company, owns no vehicles. Facebook, the world’s most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world’s largest accommodation provider, owns no real estate.” This was no longer just some speculative theory. Goodwin was simply stating what he had observed. It was right under everybody’s nose, but nobody had really put it into words before him. It was the first time that anyone had said, “The emperor isn’t wearing any clothes.” However, what Goodwin did not do—nor did the thousands of writers, speakers, and professors who have quoted him in the years since—was ask “why?”

So let’s try to find a pattern. What do all these successful companies have in common? First of all, they are hyper-scalable, which is the most important factor in successful contemporary business models. In computer science, hyper-scale is the capability of a system to properly scale up when required by the system. A hyper-scalable company is capable of increasing its offerings at a minimal cost. For instance, Airbnb is a hyper-scalable company;

Hilton is not. Airbnb has three thousand employees and can offer four million rooms. On the other hand, Hilton operates less than one million rooms while employing almost two hundred thousand people. Airbnb manages four times as many rooms as Hilton with 1.5 percent of the workforce—and they don't spend a dime on real estate.

What makes Airbnb scalable? It's based on network technology (connectivity), it handles an enormous data base (Artificial Intelligence), and it manages intangible assets (end-to-end connection). Access beats ownership. Connection rules.

What do these platform entrepreneurs have in common with the billionaires of the computer age, those of the Industrial Revolution before them, and those of the railroad era even before that? It's what I have termed "The Exponential Effect." If you can grasp its significance, it will change your future. Let me explain. As I wrote in my book *Corto Circuito*, "The Exponential Effect is the effect that a network has on enabling new products or services. When an Exponential Effect is present, the value of the economy increases according to the number of goods and services enabled by the network."

Approximately once per century in the modern era, emerging technologies have generated game-changing products—like what digital technology did with computers and steam did with locomotives. When the emerging technology combines with a new type of network—enabling the birth of revolutionary products and services—they disrupt the market and then eventually generate an exponential growth of productivity, demand, and economy.

However, The Exponential Effect will not last forever. I've read papers on an alleged "Exponential Economy," although it doesn't make sense to me. There is nothing in history that has been exponential for an extended period of time. The "Exponential Effect" is merely a temporary burst, lasting no more than a few years to a decade. I forecast this burst happening sometime between 2023 to 2030.

Any game-changing technology generates polarization

and eventually comes the disruption, as the old makes way for the new. Disruption opens new markets when a network enables the birth of a variety of new products and services; which increase productivity, introduce new needs and wants, open new markets, and create economic growth. It's a business renaissance. As I see it, that's the future of business in the AI Transformation age.

## Creating An AI-Friendly Company Strategy

Here are ten steps to guide you in creating an AI-friendly company strategy. If you keep reading you will find that I have applied these steps to a few industries; such as agriculture, automotive, construction, healthcare, hospitality, and retail—if you belong to one of these industries, please move on and read the customized version of the guide. While customizing, I have decided to make some slight changes because each industry and company is different. You may want to keep that in mind when you apply the ten steps to your company.

### 1. Define your goals:

Clearly articulate your business objectives and identify how AI can help you achieve them. Suppose you're an e-commerce company looking to improve customer experience. Your goal could be to reduce customer support response time by 50 percent using AI-powered chatbots.

### 2. Assess your data:

Evaluate the quality, quantity, and accessibility of your data. Analyze your customer support data; including the types of inquiries, response times, and customer feedback. Identify any gaps, such as missing customer preferences or interaction histories, that may need to be collected.

### 3. Build a cross-functional team:

Establish a team with a diverse range of skills; including

data scientists, software engineers, customer support representatives, and marketing specialists. Form a team consisting of these individuals who can collaborate to develop AI-driven solutions.

4. Invest in talent:

Attract and retain AI talent by providing training, professional development opportunities, and a supportive environment. Hire data scientists with expertise in Natural Language Processing and Machine Learning. Provide them with training opportunities to stay updated with the latest advancements in AI technologies.

5. Develop an AI roadmap:

Create a roadmap that outlines the specific AI projects, initiatives, and timelines for implementation. Plan to implement a pilot project focused on integrating a chatbot into your customer support system within the next six months and other interconnected emerging technologies—such as IoT, XR, Cobots, and 3D Printing—within one year. Set milestones and key performance indicators (KPIs) to track the project’s progress and success.

6. Start with small-scale pilots:

Begin by implementing AI projects on a smaller scale to validate their feasibility and effectiveness. Deploy the AI-powered solutions on a limited scale for a specific product or service category. Monitor its performance, gather feedback from customers and support agents, and refine the chatbot based on the insights gained.

7. Embrace automation:

Identify repetitive and time-consuming tasks that can be automated using AI, IoT, XR, Cobots, and 3D Printing. Automate repetitive customer inquiries, such as tracking order status or providing basic product information, using AI solutions. This will free up your customer support team to handle more complex issues and improve response times.

8. Ensure ethical considerations:

Develop ethical guidelines for AI usage within your company. Establish guidelines to ensure the AI's solutions are transparent, fair, and respectful. Regularly review and audit the AI's performance to identify and address any biases or privacy concerns.

9. Foster a learning culture:

Encourage a culture of continuous learning and experimentation. Provide employees with AI training programs to develop their understanding of AI technologies and how they can contribute to the company's AI initiatives. Encourage knowledge sharing through workshops, internal presentations, and collaboration platforms.

10. Monitor and evaluate:

Continuously monitor the performance and impact of your AI initiatives. Track customer satisfaction metrics, such as response times and feedback ratings, to assess the impact of the AI-powered solutions on improving customer experience. Continuously gather feedback from support agents and customers to make necessary adjustments and improvements.

Implementing an AI-friendly company strategy requires a comprehensive approach that addresses technological, organizational, and ethical aspects. Right after, you will need to get ready to scale to AGI. What is AGI? We will talk about it soon, but first we need to understand if your organization, processes, technical infrastructure, and data infrastructure are ready for AI Transformation. I like to call it “the five steps checkup.”

## Don't Swim Against The Current

The worst mistake you can make is to try to force your organization into AI without identifying all the barriers or chal-

allenges from a cultural and skillset perspective. To evaluate your organization's readiness for AI Transformation, I recommend following these five steps:

1. Assess organizational culture:

Evaluate your company's culture to gauge the willingness of employees to embrace AI technologies. Understand whether employees are open to explore new technologies and ideas.

2. Conduct employee surveys and feedback sessions:

Gather feedback from employees through surveys or debriefs to understand their attitudes and perceptions towards AI Transformation. Ask questions about their familiarity with AI, their concerns, and their level of readiness to adopt AI technologies in their workflow.

3. Identify champions and change agents:

Identify individuals or teams within your organization who are enthusiastic about AI and have the potential to become AI champions. These employees can drive the adoption of AI technologies, advocate for change, and help others embrace new ways of working.

4. Assess existing skillsets:

Evaluate the current skillsets of your employees to determine their readiness to work with AI technologies. Identify any gaps in technical skills, such as data analysis, programming, or Machine Learning; which are essential for AI Transformation. Understand the availability of resources to bridge these skill gaps.

5. Provide training and up-skilling opportunities:

Develop a training plan to upskill employees on AI-related concepts and technologies. Offer relevant training programs, workshops, or online courses to equip employees with the necessary knowledge and skills. Consider partnering with external

training providers or leveraging internal expertise to deliver effective training initiatives.

Here are some examples.

A bank planning to implement AI-powered chatbots for customer support should assess the cultural readiness of employees to adopt AI technologies. They would conduct surveys and feedback sessions to understand employee concerns, provide training on the use of chatbots, and highlight the benefits of AI for improved customer service.

A retail company aiming to utilize AI for demand forecasting and inventory management should assess employees' current analytical skills. They would identify skill gaps and provide training programs on data analysis, statistical modeling, and Machine Learning. This would enable employees to work effectively with AI-driven forecasting tools.

A manufacturing organization considering the implementation of AI-driven automation on the shop floor should assess the cultural readiness for technological change. They would identify change agents from different departments, involve them in the decision making process, and provide training on working with AI-powered robotics and automation systems.

## The Anatomy of Processes

You cannot strategically plan the introduction of AI technologies if you don't go through a detailed examination of your current processes to identify areas for AI automation or optimization. My advice is to start with areas that offer the highest potential for optimization and gradually expand the scope of AI Transformation based on successful implementation and demonstrated value. To examine your current workflows and processes to identify areas that can benefit from AI automation or optimization, I recommend following these five steps:

1. Map out workflows:

Begin by mapping out your existing workflows and processes across different departments or functions. Understand the step-by-step processes involved and the tasks performed by employees at each stage.

2. Identify pain points:

Identify pain points or areas where your workflows may be inefficient, time-consuming, or prone to errors. Look for tasks that are highly repetitive, involve large volumes of data, require complex data analysis, or have a significant impact on overall productivity.

3. Analyze data dependencies:

Assess the role of data in your workflows. Determine if there are tasks that heavily rely on data analysis, pattern recognition, or predictive modeling. Identify areas where AI algorithms can leverage data to enhance decision making, improve accuracy, or generate valuable insights.

4. Evaluate feasibility:

Evaluate the feasibility of introducing AI technologies in identified areas. Consider factors such as the availability and quality of data, the complexity of the tasks, and the compatibility of existing systems with AI Transformation. Assess if the tasks can be automated, optimized, or augmented by AI. Analyze the potential impact of introducing AI technologies in identified areas, estimate the potential cost savings, time savings, or quality improvements that AI Transformation can bring.

5. Prioritize areas for AI Transformation:

Prioritize the identified areas based on the feasibility and potential impact of AI Transformation. Consider factors such as the complexity of implementation, resource availability, and alignment with overall business objectives. Start with areas where

the benefits of AI Transformation are significant and the implementation challenges are manageable.

Here are some examples.

A telecommunications company should examine its customer service workflows and identify that a significant amount of time is spent on responding to repetitive customer inquiries. By implementing AI-powered chatbots, they can automate responses to frequently asked questions, freeing up customer service agents to handle more complex inquiries.

A logistics company should analyze its supply chain workflows and realize that inventory forecasting is a complex and time-consuming task. By integrating AI algorithms into their inventory management system, they can analyze historical data, market trends, and other factors to predict demand accurately, enabling optimal inventory planning and reducing carrying costs.

A financial institution should review its fraud detection processes and discover that manually analyzing vast amounts of transaction data to identify fraudulent activities is a time-intensive task prone to human error. By implementing AI algorithms, they can automate fraud detection by analyzing patterns and anomalies in real-time, reducing false positives and improving the efficiency of fraud detection processes.

### Question Your Data

To determine the readiness of your data infrastructure for AI Transformation, you must evaluate the availability, accessibility, and quality of your company's data. This evaluation will ensure that you have the necessary data foundation to support accurate AI predictions, insights, and decision making within your organization. To evaluate the availability, accessibility, and quality of your company's data for AI Transformation, I recommend following these five steps:

1. Identify data sources:

Begin by identifying the various data sources within your company. These may include customer databases, transaction records, website analytics, social media data, sensor data from IoT devices, or any other relevant sources specific to your industry or operations.

2. Assess data quantity and variety:

Evaluate the quantity of data available. Determine if you have a sufficient volume of data for AI algorithms to learn effectively. Don't forget to consider the variety of data types such as structured data (e.g., databases, spreadsheets) and unstructured data (e.g., text, images, audio) to ensure a diverse dataset for comprehensive AI analysis.

3. Data quality evaluation:

Examine the quality of your data to ensure it is accurate, reliable, and relevant for AI applications. Check for completeness, consistency, and potential errors or biases that may impact the performance and reliability of AI algorithms. Implement data cleaning and preprocessing techniques to enhance data quality if needed.

4. Data accessibility and integration:

Determine the accessibility of your data. Evaluate if it is stored in centralized databases or dispersed across different systems and departments. Consider the availability of data integration tools or APIs to consolidate and streamline data access for AI algorithms.

5. Data security and compliance:

Assess your data management practices to ensure data security, integrity, and compliance with relevant regulations such as data privacy laws (e.g., GDPR, CCPA). Implement robust data protection measures, including access controls, encryption, and

anonymization techniques, to safeguard sensitive information.

Here are some examples.

An E-commerce company analyzing customer behavior and purchase patterns to personalize product recommendations and optimize pricing strategies should assess the availability of customer transaction data, clickstream data, and browsing history. They would evaluate data quality, ensuring accurate product descriptions, reliable customer reviews, and consistent categorization for effective AI-driven personalization.

A hospital aiming to implement AI for predictive analytics in patient care should assess the availability and quality of patient medical records, laboratory test results, vital signs data, and other relevant health data. They would ensure data accessibility, integration, and compliance with patient privacy regulations (e.g., HIPAA) to protect patient confidentiality.

An industrial company looking to implement AI for predictive maintenance should evaluate the availability and quality of sensor data from machinery and equipment. They would assess data accessibility, considering whether the sensor data is easily accessible for real-time monitoring and analysis. Data security practices would be assessed to protect the integrity of the data and prevent unauthorized access.

## Flex Your Muscles

Before starting any AI Transformation, make sure that your systems have the necessary computing capabilities, storage capacity, and network infrastructure to support AI algorithms and handle the increased data processing demands. Identifying potential bottlenecks and addressing them will enable an efficient integration of AI technologies into your existing infrastructure. To assess your company's technical infrastructure for AI Transformation, I recommend following these five steps:

1. Evaluate computing capabilities:

Assess the computing power available within your company's infrastructure. Consider the capabilities of your existing hardware; such as servers, workstations, or cloud-based resources. Determine if they can handle the computational requirements of AI algorithms, which often involve complex calculations and large-scale data processing.

2. Review storage capacity:

Evaluate your company's storage capacity for handling the increased data volume associated with AI Transformation. Determine if you have sufficient storage resources to accommodate the growing data requirements. Consider factors such as the size of your datasets, the frequency of data updates, and the need for real-time data processing.

3. Assess network infrastructure:

Evaluate your company's network infrastructure, including bandwidth and connectivity. Determine if your network can handle the increased data transfer and communication demands of AI systems. Understand if you have reliable and high-speed connections to support real-time data streaming or interactions with cloud-based AI platforms.

4. Consider scalability:

Anticipate future needs and growth when assessing your technical infrastructure. Consider if your systems can scale to handle increased computational demands and growing data volumes as your AI initiatives expand. Understand if your infrastructure allows for easy scalability, such as the ability to add more computing resources or storage capacity as needed.

5. Identify potential bottlenecks:

Identify any potential bottlenecks or limitations in your technical infrastructure that may hinder AI Transformation. This

could include outdated hardware, limited storage capacity, network congestion, or insufficient computing resources. Address these bottlenecks by upgrading hardware, optimizing network configurations, or leveraging cloud computing resources.

Here are some examples.

A healthcare organization evaluating its technical infrastructure for AI Transformation may find that their existing servers and storage systems have limited computing and storage capacities. To address this, they should consider migrating their data to cloud-based platforms that provide scalable computing and storage resources to support AI algorithms and handle the increasing volume of patient data.

A retail company assessing its technical infrastructure may realize that its network connectivity is not robust enough to support real-time data processing and analysis required for AI-driven inventory management. They should invest in upgrading their network infrastructure to ensure high-speed connectivity between stores, warehouses, and cloud-based AI platforms for efficient inventory optimization.

A manufacturing company examining its technical infrastructure may find that their current computing capabilities are insufficient to handle the computational demands of AI algorithms used for predictive maintenance. They might consider deploying edge computing devices on the factory floor to enable real-time analysis of sensor data and reduce the reliance on centralized computing resources.

And now get ready for the most challenging task of your AI Transformation: building a successful AI team.

## Identifying AI Talent Needs

The first thing to do to build a successful AI team is identifying AI talent needs. This approach will ensure alignment be-

tween AI goals and required skills, leverage existing talent, and attract the necessary expertise to drive successful AI initiatives. Here are the five key steps that I recommend:

1. Assess your AI goals and requirements:

Determine the specific AI goals and objectives of your organization. Understand the areas where AI can add value and the skills needed to achieve those goals. For example, if you aim to develop AI-powered chatbots, you may require expertise in Natural Language Processing and Machine Learning.

2. Identify required roles and skills:

Identify the key roles and skills necessary to drive your AI initiatives. This may include data scientists, Machine Learning engineers, AI researchers, data analysts, and AI project managers. Consider the technical skills, domain knowledge, and experience required for each role.

3. Evaluate your existing talent pool:

Assess your current workforce to identify individuals with relevant skills and potential for AI-related roles. Look for employees who have a strong foundation in data analysis, programming, or mathematics. Offer up-skilling and training opportunities to bridge any skill gaps and help them transition into AI roles.

4. Explore external talent sources:

If your internal talent pool does not fulfill all the required roles, consider external sources. Advertise job openings targeting AI professionals, collaborate with recruitment agencies specializing in AI talent, or establish partnerships with universities or research institutions to attract top talent. Leverage online platforms and communities focused on AI to connect with potential candidates.

### 5. Encourage cross-functional collaboration:

Building an effective AI team often requires collaboration across different departments. Encourage cross-functional collaboration; enabling data scientists, domain experts, and IT professionals to work together on AI projects. This multidisciplinary approach helps ensure a holistic understanding and successful implementation of AI solutions.

## Hiring AI Talent: Skills and Qualifications

Once you have identified AI needs, it's time to hire talent. When hiring AI professionals, it's crucial to look for specific skills and qualifications that align with your organization's AI goals and requirements. This might be a problem because your company doesn't have any experience of AI yet, so your Human Resources is not skilled to select the right talents. My advice is to consider these ten key skills and qualifications:

### 1. Strong programming skills:

Look for candidates with proficiency in programming languages commonly used in AI; such as Python, R, or Java. They should have experience in writing efficient and scalable code, implementing algorithms, and working with AI frameworks and libraries.

### 2. Data analysis and statistics:

AI professionals should possess a strong foundation in data analysis and statistics. Look for candidates who have experience in data preprocessing, exploratory data analysis, statistical modeling, and hypothesis testing. Familiarity with tools like pandas, NumPy, and scikit-learn is also beneficial.

### 3. Machine learning expertise:

AI professionals should have a deep understanding of Machine Learning algorithms and techniques. Look for candidates

who are well-versed in both supervised and unsupervised learning, feature engineering, model selection and evaluation, and optimization techniques. Knowledge of popular Machine Learning libraries, like TensorFlow or PyTorch, is advantageous.

#### 4. Domain knowledge:

Consider the specific domain expertise required for your AI initiatives. Look for candidates who have knowledge and experience in the industry or domain relevant to your organization. This could include healthcare, finance, marketing, manufacturing, or any other sector.

#### 5. Neural Networks and Deep Learning:

As deep learning has become a prominent area within AI, seek candidates with expertise in neural networks, Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and other Deep Learning architectures. Experience with frameworks like Keras or TensorFlow for Deep Learning model development is valuable.

#### 6. Data management and preprocessing:

Assess candidates' abilities in data management; including data cleaning, integration, transformation, and feature engineering. They should be familiar with databases, SQL, and data preprocessing techniques to ensure high-quality data for AI models.

#### 7. Problem-solving and critical thinking:

AI professionals need strong problem-solving and critical thinking skills to tackle complex challenges. Look for candidates who can approach problems analytically, break them down into manageable components, and devise creative solutions using AI techniques.

#### 8. Continuous learning mindset:

Given the rapidly evolving nature of AI, look for candidates who have a passion for continuous learning and who stay up-to-date with the latest advancements in the field. This includes active participation in AI communities, attending conferences, and a track record of self-directed learning.

#### 9. Communication and teamwork:

Effective communication and teamwork are essential for AI professionals, as they often collaborate with cross-functional teams and stakeholders. Look for candidates with strong interpersonal skills, who can explain complex AI concepts in a clear and understandable manner.

#### 10. Advanced degrees and certifications:

While not always necessary, advanced degrees (such as a master's or Ph.D.) in fields like computer science, data science, or AI can demonstrate a candidate's depth of knowledge. Additionally, certifications in AI or Machine Learning, such as from reputable organizations or platforms, can provide evidence of their expertise.

Remember these two criteria:

There is no standard rule to hire AI skilled talents. Because the specific skills and qualifications you prioritize may vary depending on your organization's AI objectives and the roles you are hiring for, it's important to assess candidates' practical experience, problem-solving abilities, and cultural fit within your organization as well.

The best talent is already in your staff, but you just don't know it yet. Even worse, they don't know it yet. Look for employees who have a potential and train them to AI roles. Give them a chance and don't underestimate the learning potential of your team.

## Developing AI Skills Within the Existing Workforce

Developing AI skills within the existing workforce is probably the most important step to build a successful AI team. Here are my recommended five key steps to accomplish this:

### 1. Identify current skillsets and training needs:

Begin by evaluating the skills and capabilities of your existing workforce. Identify individuals who show potential or have transferable skills that can be developed for AI roles. Look for employees with a strong foundation in areas such as data analysis, programming, mathematics, or problem-solving. Determine the specific AI skills that need to be developed within your workforce. This could include knowledge of Machine Learning algorithms, data preprocessing techniques, programming languages, or AI frameworks. Pinpoint the areas where skill gaps exist and prioritize the skills that align with your AI goals.

### 2. Provide targeted training programs and practical experience:

Offer training programs tailored to the identified skill gaps. This can involve a combination of internal resources, external courses, workshops, or online learning platforms. Leverage both online and offline training opportunities to accommodate different learning styles and preferences. Encourage employees to actively participate in these programs and provide support to ensure successful skill development. Alongside training, provide opportunities for practical application of AI skills. Encourage employees to work on AI-related projects or collaborate with teams already involved in AI initiatives. This hands-on experience helps solidify their understanding of AI concepts and builds confidence in applying those skills.

### 3. Encourage knowledge sharing and staying updated:

Establish channels for knowledge sharing and collabo-

ration among employees. Encourage AI enthusiasts within your workforce to share their learnings, experiences, and best practices. This can be done through internal workshops, presentations, or online platforms where employees can exchange ideas and support each other's learning journey.

Encourage employees to stay updated with the latest trends, research, and advancements in AI. Encourage them to participate in industry conferences, webinars, or online communities focused on AI. This helps employees stay abreast of emerging technologies and best practices, enabling them to contribute effectively to AI initiatives.

#### 4. Plan Mentorship and coaching:

Pair employees who are developing AI skills with experienced AI professionals within your organization. This mentorship or coaching approach can provide guidance, support, and practical insights to accelerate their learning and growth in AI. Encourage regular check-ins and provide opportunities for mentors to share their expertise. Provide opportunities for employees to apply their AI skills collaborating to real-world AI initiatives within the organization and further refine their skills.

#### 5. Recognize and reward progress:

Acknowledge and reward employees who demonstrate progress and achievement in developing AI skills. This can include certifications, promotions, or special assignments that allow them to apply their newfound expertise. Publicly recognize their contributions and create a culture that values continuous learning and growth in AI.

This approach not only maximizes the potential of current employees, but also encourages a culture of continuous learning and innovation. It will enable organizations to tap into the existing talent pool, build a capable AI team, and drive successful AI initiatives while retaining valuable employees.

## Empowering Collaboration Between Technical and Non-technical Teams

Empowering collaboration between technical and non-technical teams is crucial for a successful AI Transformation. Collaboration will enhance the effectiveness of AI Transformation efforts, leveraging the strengths of both teams, and ultimately driving a successful AI Transformation. These are the five key steps that I recommend to promote collaboration:

### 1. Develop shared understanding and establish common goals:

Clearly define and communicate the common objectives that both technical and non-technical teams are working towards. This shared understanding creates alignment and a sense of purpose, therefore fostering collaboration and eliminating barriers caused by jargon or technical complexity. Encourage open communication and create opportunities for all team members to develop a shared understanding of AI concepts through teamwork. This can be achieved through workshops or cross-functional meetings where technical experts explain AI concepts in non-technical terms.

### 2. Establish cross-functional teams and communication:

Form cross-functional teams that include both technical and non-technical members. These teams can work together on AI projects, allowing for diverse perspectives and contributions. Assign specific roles and responsibilities to team members based on their expertise, ensuring a balanced representation from both sides. This collaboration facilitates knowledge exchange and encourages cooperation throughout the project lifecycle. Encourage active participation and create a safe space for sharing ideas, asking questions, and addressing concerns.

### 3. Create a culture of mutual respect:

Lead by example and promote collaboration within the organization, creating a culture that values and respects the expertise of both technical and non-technical team members. Encourage open dialogue, active listening, empathy, understanding, willingness to learn from one another and constructive feedback. It ensures that ideas and contributions from all team members are valued, leading to a more inclusive and collaborative environment.

### 4. Promote knowledge sharing:

Encourage technical team members to share their knowledge and insights with non-technical team members, and vice versa. This can be achieved through internal knowledge sharing sessions, lunch-and-learn sessions, or mentoring programs. Non-technical team members can gain a better understanding of AI capabilities and limitations, while technical team members can benefit from insights into business objectives and challenges. This knowledge exchange strengthens collaboration and helps align AI initiatives with business needs.

### 5. Encourage interdisciplinary projects and celebrate successes together:

Foster opportunities for technical and non-technical teams to work together on interdisciplinary projects. By collaborating on real-world projects, team members can leverage their respective skills and expertise to develop innovative AI solutions that address business challenges. This promotes a sense of shared ownership and strengthens the bonds between technical and non-technical teams. Recognize and celebrate the achievements of both technical and non-technical teams. Reward collaborative efforts, encourage teamwork, and celebrate successful cross-functional projects highlighting the collaborative efforts and positive outcomes resulting from their collaboration. This recognition reinforces the importance of collaboration and encourages further cooperation between the teams.

## Start With an AI Pilot Project

You will never know if you can become an AI-friendly company until you try. So, stop thinking about it and just do it. Start with a pilot project and adopt agile project management techniques that will allow flexibility, adaptability, and iterative development. After all, it's just a pilot project. You will learn by trial and error more than you would from any manual—including this one. Here is what I recommend to implement agile project management for your AI pilot project:

### 1. Define clear project goals:

Start by clearly defining the goals and objectives of the AI pilot project. Determine the specific problem or opportunity that the project aims to address and identify the expected outcomes. These goals will serve as a guiding framework throughout the pilot project.

### 2. Break the pilot project into manageable sprints:

Divide the AI pilot project into smaller, manageable sprints. Each sprint will focus on delivering a specific set of functionalities or features. This iterative approach will allow incremental progress and feedback loops, enabling continuous improvement and adaptation.

### 3. Form a cross-functional team:

A collaborative team structure will include a couple of AI experts, data scientists, developers, domain experts, and—most of all—stakeholders. A cross-functional team will promote collaboration between departments, knowledge sharing, and a holistic understanding of the project requirements.

### 4. Prioritize and refine the backlog:

Create a backlog of tasks, features, or functionalities that need to be implemented. Prioritize the backlog items based on

their business value. Continuously refine and update the backlog throughout the project to reflect changing priorities and requirements.

5. Adopt an iterative development approach:

Utilize agile methodologies, such as Scrum or Kanban, to facilitate iterative development. Conduct regular sprint planning meetings, where the team will decide which backlog items to work on in each sprint. Monitor progress, hold daily stand-up meetings to track progress and address any challenges, and conduct sprint reviews to assess the completed work.

Now you have a plan, but don't forget to change it—embrace flexibility and adaptability. Agile project management recognizes that requirements can evolve and change over time. Welcome changes; don't fight them. Encourage frequent communication and collaboration with stakeholders, end-users, and team members.

Your stakeholders are important. Keep them posted to engage them in decision making processes. Regularly review and prioritize the backlog based on feedback and new insights. Make necessary adjustments to enhance the project outcomes. Do it by incorporating feedback loops throughout the project, gathering feedback, and assessing the effectiveness of implemented features.

Long story short: make a plan and get ready to change it along the way. It's a pilot project.

Focus on the experience over the short-term results. Encourage experimentation, knowledge sharing, and the exploration of new AI techniques or technologies. Conduct retrospectives at the end of each sprint to reflect on successes, challenges, and areas for improvement.

Have you successfully accomplished your five-step check-up? If yes, you are ready to start your AI Transformation. But if we want our plan to be scalable—and we do want that—we need to understand the subtle, yet significant, differences between Artificial Intelligence (AI), Artificial General Intelligence (AGI), and Artificial Super-Intelligence (ASI).

AI refers to computer systems that can perform tasks that typically require human intelligence. It encompasses a wide range of technologies; such as Machine Learning, Natural Language Processing, and computer vision. AI applications are prevalent across industries; including healthcare, finance, and transportation. AGI goes beyond the narrow scope of AI and refers to highly autonomous systems that possess human-level intelligence across various domains. AGI is capable of understanding, learning, and applying knowledge in a manner that is comparable to human intelligence. Achieving AGI remains a significant challenge, as it requires the development of flexible and adaptable systems. While AGI has not yet been fully realized, researchers and organizations are actively working towards its development. AGI holds immense potential in areas such as scientific research, creativity, and problem-solving—offering broad and adaptable solutions.

Different entities can benefit from each level of Artificial Intelligence. Businesses across industries can leverage AI technologies to optimize operations, enhance customer experiences, and gain valuable insights from data. Industries like retail can utilize AI-powered recommendation systems to personalize customer experiences and drive sales. Financial institutions can employ AI algorithms for fraud detection and risk assessment.

Achieving AGI has far-reaching implications across various domains. Scientific research institutions could benefit from AGI's ability to process vast amounts of data; accelerating discoveries and advancing knowledge. AGI could assist in complex problem-solving; aiding in fields such as climate change modeling, drug discovery, and space exploration.

Successfully scaling AI to AGI is a complex and long-

term endeavor. While the path to achieving AGI and ASI is still under exploration, there are several key considerations and steps that a company can take to navigate this transition effectively.

1. Long-term vision and strategy:

Develop a clear, long-term vision for scaling AI to AGI. Align the company's strategy and goals with the potential benefits and impacts of AGI. This includes understanding the transformative potential of these technologies and their implications for the company's industry and market.

2. Research and development:

Invest in extensive research and development efforts to advance AI capabilities. Foster a culture of innovation and collaboration, encouraging interdisciplinary teams to explore cutting-edge techniques, algorithms, and architectures. Encourage partnerships with academia and research institutions to leverage their expertise in pushing the boundaries of AI technologies.

3. Talent acquisition, retention, and partnerships:

Attract and retain top AI talent to drive the company's AI initiatives forward. Seek professionals with expertise in Machine Learning, Deep Learning, robotics, and other relevant fields. Foster a supportive and stimulating environment that encourages creativity and empowers employees to explore and experiment with novel approaches. Encourage collaborations with external organizations; including research institutions, industry partners, and AI startups. Collaborative efforts can facilitate knowledge sharing, access to specialized resources, and joint research projects—accelerating progress towards AGI.

4. Data infrastructure and management:

Build a robust data infrastructure capable of handling large-scale and diverse datasets. Ensure data quality, security, and compliance to privacy regulations. Implement efficient data man-

agement practices, including data cleaning, preprocessing, and storage, to support the development and training of advanced AI models.

#### 5. Hardware and computing resources:

Invest in high-performance computing infrastructure to support the computational demands of scaling AI models to AGI. Develop partnerships with cloud service providers or consider building in-house infrastructure to ensure access to scalable computing resources.

It is important to note that scaling AI to AGI is an ongoing journey and the roadmap may evolve as technology advances and new insights emerge. Companies must remain agile, adaptable, and open to collaboration to navigate the challenges and seize the opportunities that lie ahead in achieving AGI.

#### Is ASI Even a Thing?

ASI refers to AI systems that surpass human intelligence across all domains. Unlike AGI, ASI possesses capabilities far superior to human intelligence, leading to transformative advancements and potentially reshaping society. ASI is hypothetical at this stage, but experts speculate on its potential implications.

Elon Musk, the CEO of Tesla and SpaceX, has expressed concerns about the potential risks associated with ASI. He warns about the importance of ensuring that ASI remains aligned with human values and interests. The development of ethical frameworks and robust safety measures is crucial to mitigate potential risks and harness the benefits of ASI responsibly. Musk was not the only one who called for proactive regulation and the development of safety protocols to ensure that ASI development is conducted responsibly. Among the others were Nick Bostrom, Director of the Future of Humanity Institute at Oxford University; Stuart Russell, Professor of Computer Science at UC Berkeley;

and Demis Hassabis, CEO of DeepMind.

The potential beneficiaries of ASI are more speculative, given its hypothetical nature. However, industries like advanced research, automation, and decision making processes could experience significant advancements with this technology. ASI, while hypothetical, poses both immense opportunities for transformative advancements and potential risks that require careful consideration and responsible development.

The achievement of ASI and its timeline remain uncertain, as there is no consensus on the exact projections for achieving ASI. The development of AGI and its potential progression towards ASI involves numerous technical, ethical, and societal challenges that require careful consideration and research. While experts and researchers have varying opinions on the feasibility and timeframe, it is important to recognize that ASI represents a hypothetical stage of AI development. The achievement of ASI will be a work in progress. Although Ray Kurzweil, Director of Engineering at Google, predicts that we could reach ASI by 2045, my opinion is that we will not see anything comparable to ASI until 2060.



# BE AI-READY, INDUSTRY BY INDUSTRY

## How to Become AI-Ready and Why, Industry by Industry

Now let's get back to the present and see what we can do and how to become an AI-friendly company. I have chosen six industries to exemplify it: agriculture, automotive, construction, healthcare, hospitality, and retail. For each industry I will start with the big picture and the status, then I will move to the first step: assessing needs and goals. It's an unavoidable phase to start the AI Transformation but it's a really useful practice even if you decide not to implement AI.

I will write five examples on how to start when you assess your needs and goals. At the end of this chapter you can still go back and manage the processes of your company as you always did, but you will have a clear picture of where your industry is and what AI can do to make your company thriving—and challenges connected to its implementation. Say you want to keep going and better understand what AI can give your company and how; the next chapter is about ten AI applications already existing and in development that would suite your specific business. Then I will tell you the three main reasons why I believe your company should not hesitate to embrace AI and its potential benefits, including their threats and opportunities. Eventually I will leave you with a ten step guide to implement AI and become an AI-friendly company.

### AGRICULTURE

#### The Growing Impact of AI in Agriculture

As the world grapples with the increasing challenges of food security, sustainability, and population growth, the agricul-

ture industry has been seeking innovative solutions to enhance productivity, efficiency, and environmental stewardship. In recent years, Artificial Intelligence has emerged as a game-changing technology that holds promise for transforming the agricultural landscape. As stated by Dr. Sally Rockey, Executive Director of the Foundation for Food and Agriculture Research (FFAR), “AI technologies have the potential to address some of the biggest challenges faced by the agriculture industry, such as climate change, food security, and sustainability.”

Precision agriculture is an area where AI has already made significant strides, empowering farmers to optimize their crop management practices and maximize yields. The application of AI algorithms in satellite imagery analysis, remote sensing, and sensor data collection has enabled real-time monitoring of crop health, soil conditions, and weather patterns. Companies like Taranis, a leading agricultural intelligence platform, have successfully implemented AI to detect and predict crop diseases, nutrient deficiencies, and pest infestations. By leveraging AI-powered analytics, farmers can make informed decisions on irrigation, fertilization, and pest control—leading to improved crop health and increased productivity.

The integration of AI and robotics has brought automation to the fields, revolutionizing traditional farming methods. Autonomous farming systems equipped with AI algorithms and computer vision technologies can perform tasks such as planting, harvesting, and weeding with precision and efficiency. Blue River Technology, now a part of John Deere, developed the “See & Spray” weed control system, which uses computer vision and Machine Learning to identify and precisely spray herbicides only on targeted weeds. This AI-powered solution reduces chemical usage, lowers environmental impact, and increases the overall efficiency of weed management.

AI has also found application in the livestock sector, improving animal health monitoring and management. By harnessing Machine Learning algorithms and sensor data, companies

like Connecterra have developed smart collars for cows that can monitor their behavior, health, and fertility. These collars collect real-time data and leverage AI models to identify deviations from normal patterns, detect health issues early, and optimize breeding programs. The insights provided by AI-powered livestock monitoring systems enable farmers to take proactive measures, enhance animal welfare, and improve overall productivity.

Accurate crop yield prediction is vital for effective planning and resource allocation, as stated by Dr. Mary Lou Guerinot, Professor of Biological Sciences at Dartmouth College, “The use of AI in agriculture holds great promise for improving crop productivity and resilience. AI algorithms can analyze vast amounts of data, including genomic information, climate data, and crop performance, to identify traits that contribute to yield and stress tolerance. This knowledge can be used to develop more resilient crop varieties that can withstand the challenges of a changing climate.”

AI has shown promise in this area by leveraging historical and real-time data, weather patterns, and other variables to forecast crop yields with greater accuracy. Companies like Descartes Labs have developed AI-powered platforms that combine satellite imagery, climate data, and Machine Learning models to provide reliable crop yield predictions. These predictions enable farmers to optimize their production processes, make informed marketing decisions, and mitigate potential risks associated with yield fluctuations.

AI is playing a crucial role in optimizing supply chain management and demand forecasting in the agriculture industry. By analyzing historical sales data, market trends, weather patterns, and other relevant factors, AI algorithms can generate accurate predictions of consumer demand. Companies like Tastewise leverage AI to analyze social media data and provide insights into consumer preferences and emerging food trends. This information helps farmers and food producers align their production and distribution strategies with market demand, reducing food waste and

improving overall supply chain efficiency.

While the implementation of AI in agriculture presents immense opportunities, there are also challenges to overcome. Issues such as data privacy, connectivity in rural areas, and the digital divide must be addressed to ensure equitable access to AI technologies. Additionally, the cost of AI implementation and the need for specialized skills and knowledge pose barriers for smaller farmers and rural communities.

### Agriculture: Where to Start From

The actual first step is to assess farming needs and goals. This is a must to start the AI Transformation but it's also a useful practice even if you end up not implementing AI. So, just do it.

Let me give you five examples on how to start. These examples shall be tailored to the specific agricultural activities and goals of your farm, taking in consideration factors such as farm size, location, crop types, and available resources.

#### 1. Understand your crop yield variability:

Analyze historical crop yield data and identify the factors that contribute to variability—such as soil conditions, weather patterns, and pest infestations. For example, if you notice that certain areas of your farm consistently underperform, AI can help identify the underlying causes and suggest targeted interventions, such as soil amendments or pest control measures.

#### 2. Optimize resource allocation:

Assess the usage of resources like water, fertilizers, and pesticides on your farm. Analyze data from soil sensors, weather forecasts, and crop models to determine the optimal amount and timing of resource application. This will ensure efficient resource utilization, reduces waste, and minimizes environmental impact.

### 3. Monitor crop health and disease:

Identify early signs of disease, nutrient deficiencies, or pest attacks by monitoring crop health. By detecting issues at an early stage, you can take prompt action, such as targeted treatments or adjustments to irrigation and fertilization, to prevent further damage and improve overall crop health.

### 4. Improve livestock management:

Tracking the activity levels, feeding patterns, and vital signs of animals enables early detection of illness or distress. This will help farmers intervene in a timely manner, improving animal welfare and overall farm productivity.

### 5. Enhance decision making:

Utilize historical and real-time data on weather conditions, market trends, and crop performance. These models will forecast future yields, market demand, and pricing fluctuations—enabling you to make informed decisions on crop selection, planting schedules, and sales strategies.

This completes the pre-AI Transformation phase. Now let's have a look at ten AI applications for automotive already existing and in development.

## Ten AI Applications for the Agriculture Industry

By embracing AI, the agriculture industry can thrive in the years ahead. John Deere's CEO, Samuel R. Allen, envisions AI as a catalyst for sustainable agriculture, stating, "AI will enable farmers to make better decisions, reduce waste, and enhance sustainability by optimizing the use of resources." Allen emphasizes the need for continuous innovation and collaboration between technology providers and farmers to unlock the full potential of AI in agriculture.

My opinion is that AI truly presents significant opportunities for farmers to optimize operations and enhance productivity. Precision farming has become a prominent use case, utilizing AI to optimize irrigation, monitor crop health, and predict yields. Farms are starting to leverage AI to detect diseases, predict crop yields, and provide valuable insights. Additionally, AI-powered livestock monitoring, supply chain optimization, and decision support systems have emerged as game-changers in modern agriculture.

By utilizing AI, farmers can make data-driven decisions, automate labor-intensive tasks, and optimize resource allocation. As Dr. Ramesh Raskar, Professor at MIT Media Lab, stated “AI and Machine Learning algorithms can unlock valuable insights from agricultural data, empowering farmers with the knowledge to make informed decisions. These technologies have the potential to transform traditional farming practices, making them more efficient, sustainable, and resilient.” AI algorithms can analyze vast amounts of data from sensors, satellite imagery, and weather forecasts, providing valuable insights for improved crop management. This transformative power of AI can enable farmers to enhance productivity, reduce costs, and ensure sustainable practices. The agriculture industry has already witnessed the adoption of various AI applications that are revolutionizing traditional practices. Here are some of the AI applications already existing and in development.

### 1. Autonomous farming equipment:

In the future, we can expect further advancements in autonomous farming equipment. Self-driving tractors and harvesters will navigate fields, perform precise tasks, and optimize operations without human intervention, saving time and resources. These machines will utilize AI algorithms, computer vision, and sensor technologies to detect obstacles, adjust operations based on crop conditions, and optimize routes for maximum efficiency. With ongoing research and development, we can anticipate improvements in Machine Learning capabilities and increased inte-

gration of AI with farm equipment, leading to more autonomous and intelligent farming systems.

## 2. Disease and pest detection:

AI-powered systems for disease and pest detection will continue to evolve, enabling early identification and targeted treatment. Advanced imaging techniques and Machine Learning algorithms will assist in the rapid diagnosis and effective control of crop health issues. For example, AI can analyze images of crops captured by drones or cameras to identify signs of disease or infestation. The algorithms can then provide real-time insights to farmers, enabling them to take proactive measures, such as targeted spraying or crop rotation, to prevent further spread. The future evolution of this application may involve the development of more sophisticated sensors, improved AI algorithms for image analysis, and integration with other data sources like weather data to enhance prediction accuracy.

## 3. Real-time yield monitoring:

AI algorithms will provide real-time yield monitoring capabilities, aiding farmers in tracking crop productivity, identifying yield variations, and optimizing harvesting operations. This information will facilitate better decision making and improved resource management. For instance, by using sensors and AI algorithms, farmers can precisely monitor the weight and quality of harvested crops in real-time. This data helps them adjust their harvesting strategies and optimize storage, transport, and pricing decisions. In the future, we can expect advancements in precision sensors, AI analytics, and integration with farm management systems to provide even more detailed and accurate yield monitoring.

## 4. Automated harvesting:

AI-powered robots equipped with computer vision capabilities will be able to identify ripe crops and harvest them efficiently. This technology will reduce labor costs, increase harvest-

ing speed, and minimize post-harvest losses. For example, robotic arms equipped with cameras and AI algorithms can recognize the ripeness of fruits or vegetables and harvest them with precision. As AI and robotics technology continues to advance, we can anticipate the development of more versatile and agile harvesting robots capable of handling a wider range of crops and operating in diverse farm environments.

#### 5. Climate resilience and adaptation:

AI will play a vital role in helping farmers adapt to changing climate patterns. By analyzing historical climate data, weather forecasts, and satellite imagery, AI models will provide recommendations for crop selection, irrigation scheduling, and pest management, promoting climate resilience. For instance, AI algorithms can analyze historical weather data and predict future climate patterns to help farmers decide which crops are most suitable for their region in the face of changing climate conditions. In the future, we can expect AI models to become even more accurate and sophisticated, incorporating a broader range of environmental data and providing personalized recommendations based on specific farm conditions and climate projections.

#### 6. Supply chain traceability:

AI-driven systems will enhance supply chain traceability, ensuring transparency and accountability. Utilizing blockchain and AI data analysis, farmers and consumers will have access to comprehensive information about the origin, production practices, and quality of agricultural products. This transparency builds trust between farmers and consumers and enables ethical and sustainable farming practices. In the future, we can anticipate the widespread adoption of blockchain technology and the integration of AI analytics to create a seamless and secure supply chain ecosystem, enabling real-time traceability and verification of product authenticity and quality.

### 7. Robotic weed control:

AI-powered robotic systems will continue to advance in weed detection and control. These robots will autonomously identify and selectively remove weeds, reducing reliance on herbicides and manual labor while promoting sustainable weed management practices. Advanced AI algorithms analyze images of fields captured by drones or cameras to identify different weed species and their locations. The robots then apply targeted treatments—such as precision spraying or mechanical removal—to eliminate the weeds. In the future, we can expect advancements in robotic technologies, including improved precision and agility, allowing them to navigate complex farm environments and target weeds more effectively. Additionally, AI algorithms will continue to improve in accuracy and speed, enabling real-time weed detection and facilitating immediate action.

### 8. Livestock health monitoring:

AI applications will expand to provide advanced monitoring and analysis of livestock health. Sensors, wearable devices, and AI algorithms will detect early signs of illness, optimize feeding schedules, and improve overall animal welfare. For example, sensors can monitor vital signs—such as heart rate and temperature—in livestock and transmit the data to AI algorithms. These algorithms can analyze the data patterns and identify deviations that may indicate potential health issues. Farmers can then take appropriate measures—such as adjusting feed or providing targeted medical interventions—to ensure the well-being of their animals. In the future, we can expect the development of more sophisticated wearable devices and AI algorithms that can detect a broader range of health indicators, allowing farmers to monitor and manage livestock health more effectively.

### 9. Smart irrigation systems:

AI algorithms will enhance smart irrigation systems, integrating real-time data from weather stations, soil moisture sen-

sors, and crop water requirements. These systems will dynamically adjust irrigation schedules and optimize water usage based on evolving environmental conditions, ultimately conserving water resources. Dr. Peter McCornick, Executive Director of the Water for Food Global Institute, highlighted the role of AI in water management for agriculture, stating, “AI technologies can enable real-time water monitoring, precision irrigation, and water-use efficiency, helping farmers optimize water resources and mitigate the impacts of water scarcity.” In the future, smart irrigation systems will become more precise and adaptive, incorporating advanced Machine Learning techniques and integrating with other farm management systems. They will also leverage emerging technologies such as Internet of Things (IoT) devices and satellite data to provide more accurate and timely irrigation recommendations.

#### 10. Data-driven farm management:

AI will empower farmers with data-driven insights for decision making and farm management. Advanced analytics and predictive models will provide recommendations for optimal planting dates, fertilizer application rates, and resource allocation—leading to increased productivity and profitability. For example, AI algorithms can analyze historical crop performance data, soil characteristics, weather patterns, and market trends to generate personalized recommendations for farmers. These recommendations can include optimal planting schedules, precise fertilizer application plans, and tailored resource allocation strategies. In the future, data-driven farm management will become more sophisticated, leveraging Big Data analytics, cloud computing, and AI-driven predictive models to provide real-time recommendations and enable proactive decision making. Integration with other AI applications—such as autonomous farming equipment and smart irrigation systems—will further optimize farm operations and maximize overall efficiency.

AI applications have the potential to revolutionize the ag-

riculture industry. I envision a future where AI supports climate resilience, enabling farmers to optimize operations, enhance productivity, and meet the growing demand for food in the coming years. The future evolution of these AI applications will involve advancements in technology, algorithms, and data integration—making them more accurate, efficient, and adaptable to evolving farm conditions.

## Transforming Agriculture to Feed the World

With the world's population projected to reach 9.7 billion by 2050, the demand for food is set to surge. In this context, AI holds potential to revolutionize farming practices and enable sustainable and efficient food production. In the next five to fifteen years, the adoption of AI applications will be crucial for the agriculture industry to thrive. Let us delve into the three main reasons why I believe farmers should not hesitate to embrace AI and its potential benefits.

### 1. Enhance decision making:

One of the most compelling reasons for farmers to adopt AI is its ability to augment decision making processes. Driven by Machine Learning algorithms and Big Data analytics, AI applications can process vast amounts of information and provide valuable insights to farmers.

### Opportunities:

Advanced data analysis: AI applications have the ability to process immense volumes of agricultural data. By leveraging Machine Learning algorithms, AI can analyze historical data, weather patterns, market trends, and other variables to provide valuable insights. This enables farmers to make informed decisions based on accurate predictions and actionable recommendations.

**Real-time monitoring:** AI technology facilitates real-time monitoring of critical agricultural parameters. By collecting and analyzing data on soil moisture, temperature, crop health, and other factors, AI enables farmers to have up-to-date information at their fingertips. This allows for timely decision making regarding irrigation, fertilization, disease control, and other crucial aspects of crop management.

**Risk management:** AI can play a vital role in mitigating risks faced by farmers. By analyzing historical data and current conditions, AI systems can identify potential threats such as crop diseases, pest infestations, or adverse weather events. This empowers farmers to take proactive measures to minimize losses and maximize yields, enhancing their risk management strategies.

#### Threats:

**Data privacy and security:** With AI relying heavily on data collection and analysis, ensuring data privacy and security becomes a significant concern. Farmers must implement robust measures to protect sensitive information about their farms, crops, and production practices from unauthorized access or misuse.

**Technical reliability:** While AI can enhance decision making, there is a need to address potential technical failures. Over-reliance on AI without backup systems or alternative strategies can lead to disruptions if the technology fails or provides inaccurate information. Farmers should be prepared to mitigate such risks and have contingency plans in place.

## 2. Precision is key:

AI-powered technologies like remote sensing, drones, and

autonomous vehicles are transforming agriculture into a more precise and efficient industry. By utilizing high-resolution imagery and sensors, AI can enable farmers to monitor crop health, identify pest infestations, and optimize resource allocation. Precision agriculture minimizes input wastage, reduces environmental impact, and enhances productivity.

#### Opportunities:

**Advanced monitoring capabilities:** AI-powered technologies offer farmers the ability to monitor their crops in real-time using remote sensing, drones, and autonomous vehicles. By collecting data on crop health, soil conditions, and other vital parameters, farmers gain valuable insights for precise decision making. This allows for targeted interventions such as applying fertilizers, pesticides, or irrigation only where and when needed—minimizing input wastage and reducing costs.

**Pest and disease detection:** AI algorithms can analyze high-resolution imagery and sensor data to identify early signs of pest infestations or crop diseases. By detecting these issues promptly, farmers can take immediate action, preventing the spread of pests or diseases and minimizing crop losses. This proactive approach improves overall crop health and enhances productivity.

**Resource optimization:** Precision agriculture enabled by AI helps farmers optimize resource allocation. By accurately assessing soil conditions, moisture levels, and crop requirements, farmers can allocate resources such as water, fertilizers, and pesticides precisely where they are needed. This targeted approach minimizes environmental impact, reduces chemical usage, and improves resource efficiency.

### Threats:

**Data management and analysis:** Precision agriculture generates a vast amount of data that needs to be effectively managed and analyzed. Farmers must have the necessary infrastructure and tools to collect, store, and process large datasets. Data integration and compatibility across different platforms and systems also pose challenges that need to be addressed for seamless adoption of AI-powered technologies.

**Skill and knowledge requirements:** Implementing precision agriculture requires farmers to acquire new skills and knowledge in AI technology and data analysis. The learning curve associated with adopting and effectively utilizing AI-powered tools and systems may present challenges, particularly for farmers with limited technological literacy or access to training resources.

### 3. Labor efficiency and cost reduction:

Another significant advantage of AI in agriculture is its potential to address labor shortages and reduce operational costs. As labor becomes scarce and expensive, AI-powered robots and autonomous machinery can assist in various farming tasks. By automating repetitive activities such as planting, harvesting, and monitoring, farmers can increase efficiency and productivity while reducing labor costs.

### Opportunities:

**Addressing labor shortages:** With a shrinking workforce and increasing labor costs, AI-powered robots and autonomous machinery present a viable solution to alleviate the impact of labor shortages. By automating tasks such as planting, harvesting, and monitoring, farmers can maintain operational efficiency and productivity—even with limited human labor availability.

**Increased efficiency and productivity:** AI-powered au-

tomation significantly reduces the time and effort required for repetitive tasks. By utilizing robots and autonomous machinery, farmers can accomplish more in less time, leading to increased efficiency and overall productivity. This enables farmers to focus on more complex and value-added activities that require human expertise.

**Cost savings:** By reducing reliance on manual labor, farmers can experience substantial cost savings associated with hiring, training, and managing a labor force. AI-powered automation offers a cost-effective solution that can contribute to the financial sustainability of agricultural operations, especially in the face of rising labor costs.

#### Threats:

**Initial investment costs:** Implementing AI-powered robots and autonomous machinery may require upfront investment costs. While the long-term benefits of labor cost reduction are significant, farmers need to carefully evaluate the financial feasibility and return on investment associated with adopting AI technologies.

**Technical reliability and maintenance:** AI-powered machinery requires regular maintenance and technical expertise. Ensuring the reliability of AI systems and addressing technical failures promptly is essential to minimize disruptions to farming operations. Farmers must have access to reliable technical support and have contingency plans in place to manage any unforeseen issues.

#### A 10 Step Guide to Become AI-Friendly Farmers

This is my suggested ten step guide that agriculture farms must follow to successfully introduce AI and create an AI-friendly environment.

### Step 1. Assess Farming Needs and Goals

To embark on the AI journey, farms must first evaluate their specific needs and goals. This involves considering factors such as crop types, soil conditions, water availability, and market demands. For example, a farm specializing in high-value crops may prioritize yield optimization and quality control, while a farm in a water-scarce region may focus on efficient irrigation management.

### Step 2. Educate and Build AI Awareness

To effectively integrate AI into farm operations, farmers need a solid understanding of AI concepts and applications. Participating in AI-focused workshops, attending industry conferences, and enrolling in online courses can provide valuable educational opportunities. For example, familiarity with AI technologies such as Machine Learning, computer vision, and predictive analytics will enable farmers to make informed decisions and leverage AI tools effectively.

### Step 3. Identify Data Sources and Collection Methods

Data is the fuel that powers AI algorithms. Farms should identify relevant data sources and establish efficient data collection methods. These may include soil moisture sensors, weather stations, satellite imagery, crop phenotyping technologies, and historical farm records. By collecting diverse and accurate data, farms can train AI models to deliver precise insights and predictions. For example, a farm in California may utilize soil moisture sensors connected to an IoT platform. This system will continuously measure soil moisture levels, enabling farmers to optimize irrigation schedules and reduce water waste.

### Step 4. Establish Data Management Systems

Effective data management is crucial for successful AI implementation. Farms should invest in robust data management systems that facilitate data collection, storage, organization, and

analysis. Cloud-based platforms, farm management software, or on-farm data storage solutions ensure seamless data integration and secure access. Proper data governance practices must be implemented to protect privacy and comply with regulations. For example, a large-scale farm may implement a farm management software that collects data from various sources, such as weather stations and drone imagery. The software will enable farmers to visualize and analyze data in real-time, making data-driven decisions on crop management and resource allocation.

#### Step 5. Collaborate with AI Experts

Collaborating with AI experts, agronomists, and technology providers can accelerate AI adoption and unlock its full potential. These experts bring domain knowledge and technical expertise, helping farms navigate the complexities of AI implementation. By partnering with companies specializing in AI-driven agriculture solutions, farms can access cutting-edge technologies and customized advice. For example, a farm may partner with an AI company specializing in plant disease detection. The company provides an AI-powered mobile application that analyzes images of crop leaves and accurately identifies diseases, allowing farmers to take timely action and minimize crop losses.

#### Step 6. Start with Pilot Projects

Pilot projects offer a practical way to test AI solutions on a smaller scale before full-scale implementation. Farms can select specific areas or crops to implement AI-driven technologies, evaluate their effectiveness, and measure the return on investment. This iterative approach enables farms to learn from initial deployments, identify challenges, and make informed decisions for future expansion. For example, a farm may initiate a pilot project using autonomous drones equipped with multispectral cameras to monitor crop health. The drones capture high-resolution imagery, which is processed using AI algorithms to detect areas of stress or nutrient deficiencies. The farm will evaluate the accuracy of the

system and assesses its potential for scaling up to larger crop areas.

### Step 7. Monitor and Evaluate AI Performance

Once AI systems are implemented, continuous monitoring and evaluation are essential to ensure optimal performance. Farms should regularly assess the accuracy, reliability, and efficiency of AI models and adjust them as needed. This involves analyzing the output data, comparing it with ground truth information, and identifying areas for improvement. Feedback loops enable farms to refine their AI models and enhance their decision making capabilities. For example, a farm may use an AI-based crop yield prediction system that analyzes historical data and factors such as weather patterns, soil conditions, and crop health. By comparing the predicted yields with actual harvest data, the farm will assess the accuracy of the model and will refine it over time for more accurate yield projections.

### Step 8. Scale Up and Integrate AI Solutions

After successful pilot projects, farms can gradually scale up AI solutions across their operations. This includes integrating AI technologies with existing farm management systems and workflows. Seamless integration enables farms to leverage AI insights in real-time, automate repetitive tasks, and streamline decision making processes. Collaboration between farm staff and AI technology providers is crucial to ensure a smooth transition and maximize the benefits of AI adoption. For example, an integrated farming operation may incorporate AI-powered autonomous vehicles equipped with computer vision technology for weed detection and precision spraying. These vehicles will seamlessly communicate with farm management systems, enabling efficient weed control and reducing herbicide usage.

### Step 9. Foster a Culture of Continuous Learning

AI is a rapidly evolving field, and it is vital for agriculture farms to foster a culture of continuous learning. Farms should en-

courage their staff to stay updated with the latest advancements, attend training programs, and participate in industry forums. Engaging with the AI community and sharing experiences fosters knowledge exchange and promotes innovation within the farm. For example, a farm may establish a dedicated team responsible for monitoring AI advancements and conducting regular training sessions for farm employees. This team will also collaborate with external experts to bring in fresh perspectives and explore new AI applications.

#### Step 10. Collaborate and Share Knowledge

To fully leverage the potential of AI, farms should foster collaboration and knowledge sharing within the industry. Participating in industry associations, research networks, and innovation hubs allows farms to exchange ideas, share best practices, and collectively address challenges. Collaboration fosters a supportive ecosystem where farms can learn from each other's experiences, promote AI adoption, and drive industry-wide advancements. For example, a group of farms in a specific region may form an AI-focused consortium, where they pool resources and share data for collective analysis. This collaborative effort enables farms to gain deeper insights into regional agricultural challenges and collectively develop AI-driven solutions.

## AUTOMOTIVE

### Accelerating the Automotive AI Transformation

The automotive industry is expected to undergo significant transformation with the adoption of AI and emerging technologies. The use of AI in the design and production of cars can help streamline the manufacturing process and increase efficiency, leading to cost savings. Additionally, the development of autonomous vehicles—enabled by AI—has the potential to revolutionize the way we commute and transport goods.

Smart factories will use emerging technologies such as the Internet of Things (IoT), 3D Printing, and collaborative robots to increase automation and productivity. For instance, BMW has implemented smart factory technology in its manufacturing facilities, resulting in a 30 percent increase in productivity. Additionally, smart factories can reduce downtime and improve quality control by detecting issues in real-time and making necessary adjustments. Mary Barra, CEO of General Motors, emphasized the role of AI in shaping the future of transportation, stating, “AI is a key enabler for autonomous vehicles, enhancing safety, and transforming mobility experiences.”

The rise of smart cities is also expected to have an impact on the automotive industry. With increased connectivity and data sharing, smart cities can help optimize traffic flow and reduce congestion. For example, Barcelona has implemented a smart traffic management system that uses real-time data to manage traffic flow and reduce congestion. This system has led to a 22 percent reduction in travel time and a 42 percent reduction in accidents.

According to a report by McKinsey & Company, the adoption of autonomous vehicles could lead to a 60 percent reduction in traffic accidents and a 90 percent reduction in greenhouse gas emissions by 2050. Additionally, the report estimates that the adoption of autonomous vehicles could lead to \$1.3 trillion in savings from reduced accidents and productivity gains.

The automotive industry is poised for significant transformation with the adoption of AI and emerging technologies. The development of autonomous vehicles, smart factories, and smart cities can lead to increased efficiency, safety, and sustainability. The use of AI in the design and production of cars can also help streamline the manufacturing process and reduce costs. As the automotive industry continues to evolve, it will be important for companies to embrace these technologies to remain competitive and meet the changing needs of consumers.

## Automotive: Where to Start From

The first step is to assess needs and goals. This is a must to start the AI Transformation but also, it's a useful practice even if you end up not implementing AI. So, just do it.

Let me give you five examples on how to start. These examples shall be tailored to the specific goals of the automotive company.

### 1. Improve vehicle safety and autonomous capabilities:

Identify opportunities to enhance vehicle safety and autonomous driving capabilities to assist drivers in various scenarios—such as lane-keeping, adaptive cruise control, and collision avoidance.

### 2. Optimize manufacturing processes and quality control:

Evaluate ways to improve efficiency and quality control, streamline assembly lines, reduce production time and errors, and perform quality inspections to identify defects or anomalies in manufacturing processes.

### 3. Enhance vehicle performance and fuel efficiency:

Design to enhance performance and fuel efficiency. Analyze data from sensors, engines, and other vehicle components to optimize powertrain configurations, aerodynamics, and energy management systems.

### 4. Enable personalized driving experiences and connectivity:

Analyze driver behavior and preferences to customize vehicle settings—such as seating position, climate control, and entertainment options.

### 5. Predictive maintenance and vehicle health monitoring:

Analyze sensor data and historical maintenance records to

predict potential failures or maintenance requirements—allowing for timely maintenance interventions, minimizing downtime, and optimizing vehicle performance.

This completes the pre-AI Transformation phase. Now let's have a look at ten AI applications already existing and in development.

### Ten AI Applications For the Automotive Industry

From enhancing safety and convenience to revolutionizing transportation, AI applications are driving the future of mobility. These are ten AI applications that are reshaping the automotive landscape.

#### 1. Advanced Driver Assistance Systems (ADAS):

ADAS, powered by AI, leverages sensors and algorithms to enhance driver safety and convenience. Lane departure warning, adaptive cruise control, and automatic emergency braking are examples of AI-based ADAS features. As AI algorithms continue to advance, we can expect ADAS to become even more sophisticated, incorporating real-time data from various sensors and providing enhanced situational awareness for drivers.

#### 2. Intelligent traffic management:

AI enables intelligent traffic management systems to optimize traffic flow, reduce congestion, and enhance road safety. By analyzing historical traffic data, weather conditions, and events, AI algorithms can provide real-time traffic predictions for informed route choices. The future of intelligent traffic management will see further integration of AI with smart infrastructure, connected vehicles, and real-time data sources, leading to more efficient transportation networks.

### 3. Predictive maintenance:

AI algorithms analyze vehicle sensor data to predict maintenance needs, enabling proactive scheduling and reducing unplanned downtime. In the future, predictive maintenance will evolve with advancements in AI, incorporating more data sources and sophisticated Machine Learning models. AI will enable vehicles to detect anomalies in real-time, provide more accurate maintenance recommendations, and optimize vehicle performance and reliability.

### 4. Natural Language Processing (NLP) in voice assistants:

AI-powered voice assistants integrated into vehicles allow drivers to control functions, access information, and provide hands-free assistance through voice commands. NLP technology will continue to advance, enabling more seamless and natural interactions between drivers and voice assistants. Future voice assistants will better understand context, interpret complex commands, and offer personalized recommendations—making driving experiences even more intuitive and convenient.

### 5. Enhanced driver monitoring:

AI systems for driver monitoring will evolve to provide more comprehensive analysis of driver behavior, detecting drowsiness, distraction, and cognitive load. Advanced AI algorithms will utilize facial expressions, eye movements, and other physiological signals to assess driver attentiveness. Future developments will include improved accuracy, real-time interventions, and integration with other AI applications for enhanced safety.

### 6. Augmented Reality Heads-Up Displays (HUDs):

AI-powered AR HUDs overlay essential information onto windshields, improving situational awareness for drivers. As AI algorithms become more sophisticated, AR HUDs will provide richer and more dynamic visualizations, integrating real-time data from various sources. Future HUDs will offer enhanced naviga-

tion guidance, augmented safety alerts, and personalized information—ensuring a more immersive and intuitive driving experience.

#### 7. Personalized gesture control:

AI algorithms enable vehicles to interpret and respond to hand gestures, providing intuitive control over in-car features. Future advancements will focus on refining gesture recognition accuracy, expanding gesture control capabilities, and integrating AI with other vehicle systems. Drivers will be able to interact with their vehicles effortlessly while keeping their attention on the road and intuitively controlling various functions.

#### 8. Natural Language Processing (NLP) for conversational AI:

Future AI advancements will enhance in-car voice assistants' conversational capabilities, enabling more seamless and human-like interactions with drivers. These assistants will understand complex commands, engage in meaningful conversations, and provide personalized recommendations. AI-driven conversational AI platforms will become even more intelligent by adapting to driver preferences and delivering highly personalized experiences.

#### 9. Enhanced Vehicle-to-Everything (V2X) communication:

AI-powered V2X communication enables vehicles to exchange information with other vehicles, infrastructure, and pedestrians in real-time. Future developments will focus on expanding the scope of V2X communication, enabling vehicles to gather and share more detailed information with each other. AI algorithms will continue to evolve, enabling vehicles to make more informed decisions based on the data received through V2X communication. This will result in improved road safety, reduced accidents, and enhanced overall driving experience.

## 10. Emotion recognition:

Advancements in AI will enable vehicles to recognize and respond to human emotions, leading to more personalized and responsive driving experiences. By analyzing facial expressions and physiological signals, AI can adapt the vehicle's behavior to match the driver's mood. Future developments in emotion recognition will focus on refining algorithms to better understand and interpret complex emotions. This will allow vehicles to provide tailored responses, such as adjusting ambient lighting, playing soothing music, or offering recommendations for stress relief during the drive.

It is crucial for automakers and industry stakeholders to invest in research and development, foster collaboration, and prioritize ethical considerations in the AI Transformation. The automotive industry is experiencing a remarkable transformation through the integration of AI applications.

## Driving the Future of the Automotive Industry

As the global population continues to grow, the automotive industry faces the critical task of meeting increasing transportation demands while preserving the sustainability of our planet. Integrating Artificial Intelligence into the automotive sector offers a transformative solution to address these challenges. These are the three key reasons why I believe the automotive industry should eagerly adopt AI, examining the opportunities and threats associated with this paradigm shift.

### 1. Enhanced safety:

The adoption of AI in the automotive industry holds immense potential to enhance safety on the roads. AI-powered technologies—such as advanced driver assistance systems (ADAS) and autonomous driving—can significantly reduce the risk of human error, which is a leading cause of accidents.

### Opportunity:

By embracing AI-powered safety features, the automotive industry can minimize the number of accidents and save lives. Advanced collision detection, lane departure warnings, and emergency braking systems contribute to safer driving experiences. Additionally, the AI Transformation can lead to lower insurance costs, improved customer satisfaction, and increased trust in autonomous vehicles.

### Threat:

The reliance on AI for safety critical systems introduces new vulnerabilities. Threats such as hacking, software malfunctions, and ethical considerations regarding decision making algorithms pose challenges to widespread adoption. Overcoming these threats requires robust cybersecurity measures, rigorous testing, and industry-wide collaboration to ensure the resilience and reliability of AI-driven safety features.

## 2. Improved efficiency:

AI can play a pivotal role in optimizing energy efficiency and reducing emissions in the automotive sector. AI algorithms can analyze vast amounts of data to optimize vehicle performance, route planning, and traffic management—resulting in reduced fuel consumption, minimized traffic congestion, and improved overall efficiency.

### Opportunity:

Embracing AI-driven efficiency improvements enables the automotive industry to reduce its carbon footprint, comply with environmental regulations, and appeal to eco-conscious consumers. Improved fuel efficiency not only reduces operational costs for vehicle owners but also contributes to a cleaner and more sustainable environ-

ment. Furthermore, the adoption of AI in manufacturing processes can enhance productivity and streamline supply chain management.

#### Threat:

The integration of AI technologies requires significant investments in infrastructure, data management, and workforce up-skilling. High implementation costs, technical complexities, and potential disruptions during the transition phase pose challenges for small and medium-sized automotive companies. Addressing these threats necessitates strategic planning, collaboration with technology partners, and proactive measures to manage the potential displacement of certain job roles.

#### 3. Enabling sustainable mobility:

The automotive industry faces the challenge of providing transportation solutions that are efficient and sustainable. AI can enable the development of innovative mobility solutions such as ride-sharing platforms and smart transportation networks. By optimizing routes, predicting demand, and promoting multimodal transportation, AI can help reduce the number of vehicles on the road and foster sustainable mobility options.

#### Opportunity:

Embracing AI-powered sustainable mobility solutions offers opportunities for new revenue streams, partnerships, and market differentiation. The development of autonomous ride-sharing services, electric vehicle infrastructure, and efficient transportation networks can revolutionize urban mobility, reduce congestion, and improve air quality in cities. Additionally, the integration of AI enables automotive companies to align with sustainability goals and cater to the evolving preferences of environmentally conscious consumers.

### Threat:

The transition to AI-enabled sustainable mobility requires addressing regulatory barriers, ensuring data privacy and security, and managing public acceptance. Concerns about privacy breaches, data misuse, and ethical implications of AI decision making can hinder adoption. Collaborating with regulatory authorities, implementing transparent data practices, and engaging in public dialogue are crucial steps to mitigate these threats.

The adoption of AI applications in the automotive industry is crucial to meet the transportation needs of an increasing world population while preserving the sustainability of our planet. Although a pragmatic approach is necessary to address threats, ensure data privacy, and promote ethical use of AI, the automotive industry can harness its power and shape a future where transportation is safer, more efficient, and environmentally sustainable.

## A 10 Step Guide to an AI-Friendly Automotive Company

In today's rapidly evolving automotive industry, Artificial Intelligence is playing a pivotal role in shaping the future of mobility. From autonomous driving to predictive maintenance, AI offers immense potential to enhance safety, efficiency, and customer experiences. However, successfully integrating AI into automotive companies requires careful planning and execution. This article outlines the ten crucial steps that automotive companies must follow to introduce AI effectively and create an AI-friendly environment. Each step is illustrated with real-world examples to provide practical insights into the implementation process.

### Step 1. Define Clear Objectives

Begin by defining clear objectives and identifying specific areas where AI can bring value. Whether it's optimizing manufacturing processes, improving vehicle safety, or enhancing cus-

customer experiences, having well-defined goals ensures focused implementation. For example, General Motors set a clear objective to enhance vehicle safety by utilizing AI algorithms to analyze sensor data and enable Advanced Driver Assistance Systems (ADAS).

### Step 2. Build a Skilled AI Team

Form a skilled AI team comprising of data scientists, engineers, and domain experts. This team will drive the development and implementation of AI solutions. Companies like Tesla have assembled dedicated AI teams responsible for developing self-driving technologies and enhancing overall vehicle intelligence.

### Step 3. Invest in Data Infrastructure

Establish a robust data infrastructure to collect, store, and analyze large volumes of data. AI relies heavily on data—and a solid foundation is crucial for successful implementation. For instance, Toyota partnered with Microsoft to create a cloud-based data platform to support their AI initiatives, enabling real-time data analysis and driving innovations in vehicle connectivity.

### Step 4. Collect and Prepare Quality Data

Gather high-quality and diverse datasets to train AI models effectively. This includes collecting data from sensors, cameras, customer feedback, and other sources. Audi collects extensive sensor data from their vehicles to train AI algorithms, enabling advanced driver assistance and autonomous capabilities.

### Step 5. Leverage Machine Learning and Deep Learning

Utilize Machine Learning (ML) and Deep Learning (DL) algorithms to extract insights from data and make accurate predictions. ML algorithms can analyze historical data to predict maintenance needs, optimize routes, or detect anomalies in vehicle performance. DL algorithms, on the other hand, excel at image

recognition tasks, enabling applications such as driver monitoring and pedestrian detection.

#### Step 6. Implement Edge Computing

Embrace edge computing to process AI algorithms directly on in-vehicle systems. By bringing AI capabilities closer to the source of data, edge computing reduces latency, improves real-time decision making, and enhances overall system performance. NVIDIA's DRIVE platform integrates edge AI computing, allowing vehicles to process AI algorithms locally for instant response.

#### Step 7. Collaborate with AI Solution Providers

Partner with AI solution providers and startups to leverage their expertise and accelerate AI implementation. Collaborations with companies like Mobileye, Waymo, and NVIDIA can enable access to cutting-edge technologies and accelerate the development of autonomous driving capabilities.

#### Step 8. Ensure Data Security and Privacy

Implement robust data security and privacy measures to protect sensitive customer data. Encryption, access controls, and secure data storage are crucial to maintain customer trust and comply with data protection regulations. Companies like BMW prioritize data security and employ stringent measures to protect customer information gathered from AI-powered systems.

#### Step 9. Continuously Train and Update AI Models

Invest in continuous training and updating of AI models to keep pace with evolving technologies and data. Regular model re-training ensures optimal performance, accuracy, and adaptability to changing conditions. Tesla's autopilot system regularly updates AI models with data collected from its fleet, improving its autonomous capabilities over time.

### Step 10. Foster a Culture of Innovation

Promote a culture of innovation that embraces AI technologies and encourages experimentation. Create an environment where employees are encouraged to explore new ideas and collaborate on AI-driven initiatives. Ford's Research and Advanced Engineering team, for example, is known for fostering a culture of innovation, encouraging employees to explore emerging technologies and develop AI-driven solutions for future vehicles.

## CONSTRUCTION

### Constructing the Foundation of the AI Transformation

With the rise of smart cities, there is a growing need for construction companies to adopt new technologies to better manage their projects and buildings. Andrew Anagnost, President and CEO of Autodesk, highlights the role of AI in construction, stating, "AI can enable construction companies to harness data and gain actionable insights, resulting in improved project outcomes and cost efficiencies."

Smart cities are designed to improve the quality of life for residents by using advanced technologies to manage and optimize resources such as energy, transportation, and public safety. The construction industry plays a crucial role in the development of these smart cities, as they are responsible for building the infrastructure and buildings that will be used to support these technologies.

One example of a smart city project that is using AI and other emerging technologies is the Masdar City project in Abu Dhabi, UAE. This project is a sustainable city that is designed to be carbon-neutral and zero-waste. The city is using AI to optimize its energy usage, water consumption, and waste management. For example, the city uses smart sensors to monitor and adjust the lighting and air conditioning systems in buildings based on occupancy levels, resulting in significant energy savings.

Another example of a construction project that is using AI

is the Hudson Yards development in New York City. The project is using a digital twin model—which is a virtual representation of the physical building—to monitor the construction process in real-time. The digital twin model allows the construction team to identify potential issues before they occur, reducing the risk of delays and cost overruns.

In addition to smart cities, the construction industry is also benefiting from the use of 3D Printing technology. 3D Printing is being used to create complex building components quickly and efficiently, reducing the time and cost of construction. For example, in Dubai, a 3D printed office building was constructed in just seventeen days, at a cost of only \$140,000. This technology has the potential to revolutionize the construction industry, allowing buildings to be constructed faster, cheaper, and with less waste.

### Construction: Where to Start From

The construction industry is on the brink of a transformative journey, with artificial intelligence as its guiding light. Whether you're a construction conglomerate or a local contractor, embracing AI can revolutionize your operations. However, the key to success lies in knowing where to begin.

The first crucial step in your AI Transformation is the assessment of your needs and goals. This fundamental exercise not only kickstarts your AI Transformation but also serves as a compass, guiding your strategic decisions even if AI implementation isn't your immediate objective.

Let me give you five examples on how to start. These examples are tailored to the specific goals of the automotive company.

#### 1. Enhance safety and efficiency at construction sites:

Identify opportunities to enhance safety and efficiency at your construction sites. AI-powered solutions can be employed to monitor and ensure compliance with safety regulations, detect potential hazards, and optimize resource allocation.

2. Streamline project management and planning:

Evaluate ways to streamline project management and planning processes. AI can assist in project scheduling, resource allocation, cost estimation, and risk assessment to help you deliver projects on time and within budget.

3. Improve equipment maintenance and productivity:

Harness AI to optimize equipment maintenance and enhance productivity. Predictive maintenance algorithms can analyze sensor data to schedule maintenance proactively, reducing downtime and improving equipment longevity.

4. Enhance building design and sustainability:

Utilize AI in building design to improve sustainability. AI-driven simulations can evaluate various design options for energy efficiency, which helps to reduce environmental impact.

5. Facilitate remote monitoring and inspection:

Implement AI-powered remote monitoring and inspection systems. These technologies enable real-time monitoring of construction progress, reducing the need for on-site visits and improving project oversight.

Once you've assessed your unique needs and set your goals in motion, you'll be better equipped to explore the AI applications available in the construction industry. From autonomous construction vehicles to smart construction materials, AI has the potential to reshape the landscape of construction. The journey begins with a clear vision and a commitment to embrace the possibilities that AI offers in making construction safer, more efficient, and sustainable.

Ten AI Applications for the Construction Industry

The construction industry is undergoing a remarkable

transformation fueled by advancements in AI technologies. AI applications are rapidly reshaping the way construction projects are planned, executed, and managed—leading to improved productivity, enhanced safety, and cost optimization. These are ten cutting-edge AI applications for the construction industry that are set to revolutionize the way we build and create a sustainable future.

### 1. Predictive maintenance:

One of the significant challenges in the construction industry is equipment failure that results in costly delays and downtime. AI-powered predictive maintenance systems are mitigating this issue by using Machine Learning algorithms to analyze sensor data and historical records. By monitoring factors such as vibration patterns, temperature, and usage, AI can predict potential equipment failures before they occur. For example, a construction company may implement a predictive maintenance system that analyzes real-time data from equipment sensors, alerting them to necessary maintenance and reducing costly breakdowns.

### 2. Advanced materials analysis:

The selection of construction materials plays a crucial role in the durability and sustainability of structures. AI applications are revolutionizing this process by leveraging Machine Learning algorithms to analyze vast amounts of data. These algorithms consider factors like strength, durability, and sustainability to identify materials that meet the project's requirements. By optimizing material selection, construction companies can enhance structural integrity while reducing environmental impact. For example, AI algorithms can analyze data on different material properties and recommend the most suitable options for a specific project.

### 3. Robotics and 3D Printing:

AI integration with robotics and 3D Printing technologies is reshaping on-site construction processes, enhancing speed, precision, and efficiency. Robotic arms and 3D printers work col-

laboratively, constructing complex structures layer by layer. This technology allows for automation of repetitive tasks such as brick-laying, which reduces the reliance on manual labor and improving productivity. For example, a construction site may utilize robotic arms equipped with AI algorithms to automate the bricklaying process, resulting in faster construction and higher accuracy.

#### 4. Construction site monitoring:

AI-powered sensors and drones provide real-time monitoring of construction sites that ensures compliance with safety regulations, tracking progress, and detecting potential issues. These advanced monitoring systems capture data, analyze it, and provide actionable insights to site managers. For example, drones equipped with AI algorithms can perform aerial inspections that identify safety hazards and monitor construction progress, improving site management and risk mitigation.

#### 5. Automated quality control:

AI algorithms play a crucial role in automating quality control processes in construction projects. By leveraging computer vision and Machine Learning, AI systems can identify defects, deviations from design specifications, and construction errors. Automated quality control allows for prompt corrective actions, ensuring adherence to project standards. For example, AI-powered computer vision technology can analyze images and video from construction sites to detect defects and ensure compliance with safety protocols.

#### 6. Augmented Reality for construction:

AR technologies are revolutionizing construction project visualization and execution. Contractors and architects can use AR headsets or devices to overlay digital models onto the physical environment, facilitating precise on-site positioning and reducing errors. AR enables stakeholders to experience digital models of buildings in real-world settings, which enhances collaboration and detects design flaws early on. For example, using AR technology, architects can visualize and assess how a proposed structure will

fit into the existing environment and optimize design decisions.

#### 7. Predictive cost estimation:

Accurate cost estimation is crucial for construction project planning and budgeting. AI algorithms leverage historical project data, market trends, and construction plans to predict project costs more accurately. This application assists in budget allocation, risk assessment, and resource management. For instance, AI-powered predictive cost estimation tools can analyze historical project data, consider various parameters, and provide accurate cost estimates that improve project planning and financial decision making.

#### 8. Construction site optimization with digital twins:

Digital twin technology combined with AI has the potential to revolutionize construction site operations. By creating virtual replicas of physical construction sites and continuously updating them with real-time data, construction teams can gain valuable insights into resource allocation, workflow optimization, and risk mitigation. AI algorithms enable advanced analytics, predictive modeling, and simulation of different scenarios that empower proactive decision making and efficient resource utilization. For example, construction companies can use digital twins and AI to simulate and optimize construction workflows, identifying bottlenecks and improving overall site productivity.

#### 9. Sustainable construction practices:

AI applications facilitate the adoption of sustainable construction practices by analyzing data and providing insights on energy efficiency, waste reduction, and eco-friendly materials. By incorporating AI-driven sustainability strategies, construction companies can contribute to a greener and more sustainable future. AI algorithms can analyze data from sensors, control systems, and historical records to optimize energy usage, reduce waste, and select environmentally friendly materials. For example, AI-powered systems can automatically adjust energy consumption based on

occupancy and environmental conditions to reduce energy waste and lower operational costs.

#### 10. Autonomous heavy machinery:

Fully autonomous heavy machinery equipped with AI algorithms is set to revolutionize construction sites. These machines can navigate complex environments, perform tasks efficiently, and optimize productivity. Autonomous vehicles and machinery reduce the need for human intervention, enhancing safety and productivity on construction sites. For example, autonomous excavators and bulldozers equipped with AI algorithms can efficiently perform tasks—such as excavation and grading—with higher precision and productivity.

As the global population increases and urbanization continues to rise, the construction industry faces the challenge of meeting the growing demand for infrastructure while preserving a sustainable environment. AI applications offer innovative solutions to address these challenges. By adopting AI technologies, construction companies can enhance productivity, optimize resource utilization, reduce costs, improve safety, and contribute to sustainable practices.

### Meeting the Needs of a Growing World

The construction industry faces the task of meeting increasing infrastructure demands while preserving the planet's sustainability. To address this challenge, the construction industry must adopt the power of AI applications. These are the three key reasons why I believe that the construction industry should eagerly embrace AI.

#### 1. Enhance efficiency and productivity:

Embracing AI offers a significant opportunity for the construction industry to enhance efficiency and productivity. AI-powered applications streamline and optimize various aspects of the

construction process, resulting in reduced time, costs, and waste. Machine Learning algorithms analyze vast amounts of data that enables informed decision making and automation of repetitive tasks. Predictive maintenance algorithms detect equipment failures before they occur, minimizing downtime and costly repairs. By leveraging AI, construction companies can complete projects faster, allocate resources more effectively, and maximize operational efficiency.

#### Opportunity:

AI-driven efficiency and productivity improvements allow construction companies to deliver projects on time and within budget. By optimizing resource allocation and streamlining processes, construction firms can enhance their competitive advantage, attract more projects, and increase profitability. AI also enables faster project completion that allows for greater scalability and business growth.

#### Threat:

Failing to adopt AI technologies may result in inefficiencies, missed project deadlines, and increased costs. Construction companies that lag in AI adoption risk losing out to competitors who leverage AI's transformative capabilities. The inability to optimize processes and harness AI's potential may lead to diminished market share and reduced profitability.

#### 2. Improve sustainability and environmental stewardship:

The construction industry faces increasing pressure to prioritize sustainability and minimize its environmental impact. AI algorithms can analyze materials to identify eco-friendly and energy-efficient alternatives, reducing the industry's carbon footprint. Digital twins and real-time monitoring enable construction site optimization, better resource allocation, and waste reduction. AI can also optimize energy usage in buildings to promote energy efficiency and environmental stewardship.

### Opportunity:

By embracing AI, the construction industry can align with sustainable development goals and contribute to a greener future. Adopting sustainable practices enhances brand reputation, attracts environmentally conscious clients, and opens doors to government contracts and incentives.

### Threat:

Construction firms that overlook the potential of AI for sustainability risk falling behind on regulatory requirements and client expectations. Inadequate environmental practices may result in reputation damage, loss of clients, and missed opportunities for growth. Failure to embrace AI-driven sustainability practices may hinder the industry's ability to adapt to changing environmental regulations and market demands.

### 3. Enhance safety and risk management:

Safety is of paramount importance in the construction industry, and AI applications can significantly enhance safety measures and risk management. Real-time monitoring through AI-powered sensors and drones can identify safety hazards and ensure compliance with regulations. Automated quality control using computer vision and Machine Learning detects defects and construction errors to enable prompt corrective actions.

### Opportunity:

By implementing AI-driven safety measures, construction companies can create a culture of safety, protect workers, and enhance their reputation as responsible employers. AI-enabled risk management ensures compliance with safety regulations, reduces insurance premiums, and fosters a positive work environment.

### Threat:

Neglecting AI-driven safety and risk management solutions puts construction companies at higher risk of accidents, injuries, and legal liabilities. Failure to adopt AI technologies may result in compromised safety standards, increased project delays due to accidents, and reputation damage. Construction firms that disregard AI-driven safety improvements risk losing skilled workers and facing legal consequences.

The enhanced efficiency, improved sustainability, and increased safety provided by AI are key reasons why the construction industry should eagerly adopt this transformative technology. By leveraging AI, construction companies can not only address the challenges posed by population growth but also pave the way for a more sustainable and intelligent future.

### A 10 Step Guide to an AI-Friendly Construction Company

It is crucial for construction companies to follow a strategic approach to introduce AI effectively and create an AI-friendly environment. These are the ten steps that I believe are crucial in the AI implementation process.

#### Step 1. Define Clear Objectives and Identify Potential Use Cases

Begin by defining clear objectives for AI implementation in construction. Identify potential use cases where AI can bring the most value, such as optimizing project scheduling, improving quality control, or enhancing safety monitoring. For example, a construction company may set an objective to reduce project delays by utilizing AI algorithms to predict potential bottlenecks and optimize resource allocation.

### Step 2. Assess Data Availability and Quality

Evaluate the availability and quality of data needed for AI implementation. Identify relevant data sources, such as project records, equipment data, and sensor data. Ensure the data is accurate, complete, and properly labeled for training AI models. For example, a construction company may assess the availability of historical project data, sensor data from equipment, and satellite imagery for site analysis.

### Step 3. Build Cross-functional Teams and Establish Leadership Support

Form cross-functional teams consisting of domain experts, data scientists, IT professionals, and project managers. This collaborative approach ensures a comprehensive understanding of both construction processes and AI technologies. Secure leadership support to drive AI initiatives, allocate resources, and foster organizational change. Leaders can advocate for AI adoption, encourage knowledge sharing, and create an AI-friendly culture within the company.

### Step 4. Invest in Data Infrastructure and Tools

Invest in robust data infrastructure and tools to support AI implementation. This includes data storage, processing capabilities, and AI-specific tools like Machine Learning frameworks and data visualization platforms. For example, a construction company may invest in cloud-based solutions to store and process large volumes of construction data efficiently.

### Step 5. Develop Partnerships and Collaborate with AI Experts

Collaborate with AI experts, technology partners, and research institutions specializing in construction AI applications. Strategic partnerships can bring expertise, innovative solutions, and accelerate the implementation process. Construction companies can leverage external knowledge and experience to address

industry-specific challenges. For instance, partnering with an AI startup that specializes in construction safety monitoring can provide valuable insights and customized solutions.

#### Step 6. Conduct Pilot Projects and Proof-of-Concepts

Initiate pilot projects and proof-of-concepts to validate the effectiveness of AI applications in the construction context. Select specific areas where AI can make an immediate impact, such as predictive maintenance, resource optimization, or progress monitoring. For example, a construction company can pilot an AI-based predictive maintenance system on a subset of equipment to assess its ability to detect potential failures and reduce maintenance costs.

#### Step 7. Develop AI Models and Algorithms

Invest in developing AI models and algorithms tailored to construction-specific challenges. Train Machine Learning models on relevant data to predict project outcomes, optimize resource allocation, or automate quality control processes. For example, an AI model can analyze construction site images to detect safety hazards or identify deviations from design specifications.

#### Step 8. Implement Change Management Strategies

Implement change management strategies to ensure a smooth transition and acceptance of AI within the organization. Focus on training employees, addressing concerns, and fostering a culture of AI adoption. Provide comprehensive training programs to enhance AI literacy among employees and emphasize the benefits of AI in improving productivity, efficiency, and safety. Encourage open communication channels to address any fears or misconceptions about AI replacing human roles.

#### Step 9. Continuously Monitor and Evaluate AI Performance

Establish mechanisms to continuously monitor and evalu-

ate the performance of AI applications. Regularly assess the accuracy, effectiveness, and return on investment of implemented AI solutions. Collect feedback from end-users and make necessary improvements to enhance AI performance and address emerging challenges. For example, a construction company can monitor the accuracy of an AI-based progress monitoring system and refine it based on feedback from project managers and field personnel.

#### Step 10. Foster a Culture of Continuous Learning and Innovation

Promote a culture of continuous learning and innovation to keep up with advancements in AI technologies and explore new opportunities. Encourage employees to stay updated with the latest AI trends, attend industry conferences, and participate in training programs. Foster an environment where innovative ideas are encouraged and employees are empowered to experiment with new AI applications. This culture of continuous learning and innovation enables construction companies to stay at the forefront of AI adoption and drive industry transformation.

## HEALTHCARE

### Artificial Intelligence Powered Healthcare

The healthcare industry has been experiencing significant changes as a result of the adoption of AI and other emerging technologies. These technologies have the potential to improve patient outcomes, enhance clinical decision making, and reduce healthcare costs. Dr. Fei-Fei Li, a prominent Stanford AI researcher and Co-Director of Stanford Institute for Human-Centered AI, emphasizes the potential of AI in healthcare, stating, “AI can bring an unprecedented level of precision, accuracy, and efficiency in medical diagnosis and treatment planning.”

AI algorithms can analyze large datasets, such as medical

images and patient records, to identify patterns and aid in early disease detection. Companies like Zebra Medical Vision are developing AI solutions that detect abnormalities in medical imaging and empower healthcare professionals to provide timely interventions.

One way that AI is being used in healthcare is through predictive analytics. Predictive analytics involves the use of algorithms to analyze data and identify patterns that can help predict future events, such as patient outcomes. For example, AI can be used to predict the likelihood of patient readmissions or complications after surgery, allowing healthcare providers to take proactive measures to prevent these events from occurring.

Another area where AI is being used in healthcare is through image recognition technology. AI can analyze medical images, such as X-rays and MRIs, to identify anomalies that may not be immediately noticeable to the human eye. This can lead to earlier and more accurate diagnoses that improve patient outcomes.

AI is also being used in drug discovery and development. Traditional drug discovery and development can take years and cost billions of dollars. AI can be used to analyze vast amounts of data to identify potential drug candidates and predict their efficacy. This can speed up the drug development process and reduce costs.

Smart hospitals and smart healthcare systems are being developed. These systems use IoT devices and sensors to monitor patient health in real-time, allowing healthcare providers to respond to potential issues before they become more serious. Smart hospitals can also use AI to optimize the use of resources, such as hospital beds and equipment. One example of a smart healthcare system is the “Connected Hospital” at the Texas Medical Center in Houston. The Connected Hospital uses IoT devices and sensors to monitor patient health in real-time and allow healthcare providers to provide more personalized care. The system can also use AI to predict potential health issues and optimize hospital operations.

However, the adoption of AI in healthcare also presents

challenges. One major challenge is the need to ensure that AI is used in an ethical and responsible manner. There are concerns about the potential for AI to perpetuate biases and discriminate against certain groups of patients. There are also concerns about data privacy and security, as healthcare data is highly sensitive. As AI continues to evolve and become more prevalent in healthcare, it will be important for healthcare professionals, policymakers, and technology developers to work together to ensure that the technology is used to benefit patients and improve healthcare outcomes.

### Healthcare: Where to Start From

Artificial Intelligence will be a transformative force for Healthcare by enhancing patient care, diagnosis, and operational efficiency. Whether you are a healthcare provider, a pharmaceutical company, or a technology firm looking to make a difference, understanding where to initiate your AI transformation journey is crucial.

Begin this journey with the first essential step: assessing your needs and goals. This foundational exercise not only sets the stage for AI implementation but also serves as a compass for making informed decisions, whether or not AI is your ultimate destination.

To help you navigate the complexities of AI Transformation in healthcare, here are five tailored starting points:

#### 1. Enhance diagnostic accuracy and speed:

Identify opportunities to improve diagnostic accuracy and speed using AI. Implement AI algorithms to assist healthcare professionals in interpreting medical images—such as X-rays and MRIs—to aid in early disease detection.

#### 2. Optimize patient care and monitoring:

Evaluate ways to enhance patient care and monitoring

through AI-driven solutions. These can include remote patient monitoring, predictive analytics for patient deterioration, and personalized treatment plans.

### 3. Streamline healthcare operations:

Utilize AI to streamline healthcare operations. Implement AI-powered systems for appointment scheduling, resource allocation, and inventory management to optimize efficiency and reduce administrative burdens.

### 4. Drug discovery and development:

Leverage AI in pharmaceutical research and development. AI algorithms can analyze vast datasets to identify potential drug candidates and speed up the drug discovery process.

### 5. Healthcare robotics and automation:

Explore the integration of AI-driven robotics and automation in healthcare. This includes the use of surgical robots, AI-assisted surgeries, and robotic drug dispensing systems to enhance precision and reduce human error.

Once you've assessed your specific needs and established your goals, you'll be ready to explore the AI applications available in healthcare. From virtual health assistants to AI-guided drug delivery, AI holds the promise of revolutionizing patient care and healthcare operations. The AI Transformation begins with a commitment to improve health outcomes and make healthcare more accessible and efficient for all.

## Ten AI Applications for the Healthcare Industry

AI applications have the potential to transform healthcare delivery by offering personalized medicine, real-time health monitoring, and intelligent diagnostic capabilities. While some of these applications are already making strides, others are on the horizon. Here are ten AI applications that are set to redefine healthcare.

### 1. Personalized medicine:

AI applications in personalized medicine will change the way healthcare is delivered by tailoring treatments to an individual's unique genetic makeup, medical history, and lifestyle factors. For example, AI algorithms can analyze genomic data to identify genetic variants associated with certain diseases and recommend targeted therapies. This approach maximizes treatment efficacy, minimizes adverse effects, and improves patient outcomes.

### 2. Real-time health monitoring:

Wearable devices and biosensors powered by AI will enable continuous real-time monitoring of vital signs, such as heart rate, blood pressure, and glucose levels. This technology will empower individuals to take proactive control of their health and allow healthcare providers to detect potential health issues early on. For example, AI-powered wearables can analyze heart rate variability patterns to predict the onset of cardiovascular events. Early detection through real-time monitoring can lead to timely interventions and significantly improve patient outcomes.

### 3. Virtual healthcare assistants:

AI-powered virtual assistants will enhance patient engagement and support by providing personalized health information, medication reminders, and lifestyle guidance. These assistants will be available 24/7, ensuring convenient and reliable healthcare support. For example, virtual healthcare assistants can leverage AI algorithms to analyze a patient's medical history, symptoms, and medications to provide tailored advice on managing chronic conditions. They can also offer mental health support by providing resources and coping strategies.

### 4. Robot-assisted surgery:

AI applications will enhance surgical precision by enabling robotic assistance during complex procedures. Surgeons will be able to perform minimally invasive surgeries with greater accuracy, reducing post-operative complications and improving

patient recovery. For example, AI-powered surgical robots can analyze real-time patient data, such as vital signs and tissue characteristics, to assist surgeons in making precise incisions and sutures. This technology improves surgical outcomes and shortens recovery time for patients.

#### 5. Intelligent imaging analysis:

AI algorithms will significantly enhance the analysis of medical images, such as X-rays, MRIs, and CT scans. These applications will expedite diagnosis, enhance accuracy, and assist radiologists in detecting subtle abnormalities. For example, AI-powered image analysis can detect early signs of diseases like cancer by analyzing imaging features, identifying patterns, and comparing them to a vast database of cases. This can help radiologists make more accurate diagnoses and develop appropriate treatment plans.

#### 6. Drug discovery and development:

AI will play a pivotal role in accelerating the drug discovery and development process. Machine Learning algorithms can analyze vast amounts of genomic data, identify potential drug targets, and simulate drug interactions, leading to faster and more efficient development of new treatments. For example, AI algorithms can analyze genetic data from thousands of patients to identify biomarkers associated with a specific disease. This information can then be used to develop targeted therapies that address the underlying molecular mechanisms.

#### 7. Smart hospital management:

AI applications will optimize hospital operations by analyzing patient flow, resource allocation, and staff scheduling. These systems will enhance efficiency, reduce waiting times, and improve the overall patient experience. For example, AI algorithms can analyze real-time data from electronic health records and patient monitoring devices to predict patient demand, en-

abling hospitals to allocate resources effectively and avoid bottlenecks in care delivery.

#### 8. Advanced diagnostics:

Future AI applications will enable early and accurate detection of diseases—including cancer—through advanced diagnostic tools. AI algorithms can analyze patient data, biomarkers, and medical imaging to identify patterns and markers indicative of specific conditions, which enables timely interventions. For example, AI algorithms can analyze mammograms and detect subtle signs of breast cancer that might be missed by human observers. This early detection can lead to earlier treatment and improved survival rates.

#### 9. Health predictive analytics:

AI algorithms can leverage large-scale healthcare data to predict disease outbreaks, identify at-risk populations, and optimize preventive measures. These applications can support public health initiatives and enable proactive interventions to mitigate the spread of diseases. For example, AI algorithms can analyze demographic data, environmental factors, and disease patterns to predict the likelihood of an outbreak and guide targeted interventions such as vaccination campaigns or public health awareness initiatives.

#### 10. Precision population health:

AI applications can aid in population health management by analyzing large datasets to identify trends, risk factors, and interventions tailored to specific population segments. This approach optimizes healthcare resource allocation, preventive strategies, and targeted interventions. For example, AI algorithms can analyze demographic and health data to identify populations at higher risk of developing chronic conditions. This information can then be used to implement targeted interventions, such as lifestyle modification programs or preventive screenings.

## Transforming Healthcare in an Aging World.

With an increasingly aging world population, the healthcare industry is recognizing the importance of adopting AI applications. These are the three key reasons why I believe that the healthcare industry should embrace AI.

### 1. Improve accuracy and efficiency:

AI algorithms possess the ability to analyze vast amounts of healthcare data swiftly and accurately, even surpassing human capabilities in certain tasks. By integrating AI into various healthcare processes, there are significant opportunities for improved accuracy and efficiency.

#### Opportunity:

AI can assist in precise diagnoses, treatment plan optimization, and streamlined operations.

#### Threat:

Data privacy and security threats, potential biases in algorithms, and the need for robust validation of AI systems should be carefully addressed to ensure patient safety and build trust in AI-powered healthcare solutions.

### 2. Patient-centric personalized care:

AI enables personalized medicine and virtual healthcare assistants that cater to individual needs, preferences, and medical histories, offering immense opportunities for patient-centric care.

#### Opportunity:

This approach empowers individuals to actively participate in their own care, enhances patient engagement and satisfaction, and leads to better treatment adherence and health outcomes.

**Threat:**

Ethical considerations regarding the use of personal health data, ensuring transparency in AI algorithms, and maintaining the human touch in healthcare delivery should be carefully navigated to avoid potential threats to patient autonomy, privacy, and the doctor-patient relationship.

**3. Timely prevention:**

AI applications, such as real-time health monitoring and predictive analytics, have the potential to enable early detection of health issues, prompt interventions, and preventive measures.

**Opportunity:**

This proactive approach can significantly reduce the burden of chronic diseases, prevent complications, and improve population health outcomes. Opportunities lie in leveraging AI to identify patterns and risks, providing timely interventions, and implementing preventive measures.

**Threat:**

A need for robust data infrastructure, ensuring data accuracy and reliability, and addressing the potential risks of over-diagnosis and medicalization, which could lead to unnecessary treatments and interventions.

The aging world population presents challenges that require innovative solutions, and the adoption of AI in healthcare offers opportunities to improve accuracy, efficiency, personalized care, and preventive interventions. A pragmatic approach is necessary to address threats such as data privacy, algorithm biases, ethical considerations, and the potential risks of overreliance on AI.

**A 10 Step Guide for an AI-Friendly Healthcare Company**

The AI Transformation is reshaping patient care, research, and operational efficiency. To fully leverage the potential of AI

and create an AI-friendly environment, healthcare companies must follow a strategic and well-defined approach. These are the ten essential steps that healthcare companies should take to successfully introduce AI.

### Step 1. Define an AI Strategy

Start by defining a clear AI strategy that aligns with the organization's goals and priorities. Identify specific areas where AI can make the most impact, such as clinical decision support, patient engagement, or operational optimization. For example, a hospital can establish an AI steering committee comprised of key stakeholders from different departments. Together, they will identify the implementation of an AI-powered clinical decision support system to enhance diagnostic accuracy and treatment planning.

### Step 2. Build a Robust Data Infrastructure

Ensure that the healthcare company has a robust data infrastructure in place to support AI initiatives. This includes data collection, storage, integration, and security measures to maintain patient privacy and comply with regulatory requirements. For example, a healthcare organization may invest in a secure and scalable cloud-based platform that can efficiently handle and process large volumes of structured and unstructured data, such as electronic health records, medical images, and patient-generated data.

### Step 3. Foster a Culture of Data Governance

Establish data governance policies and procedures to ensure data quality, integrity, privacy, and security. Define roles and responsibilities for data stewardship, access control, and compliance with data protection regulations. For example, a hospital may appoint a Chief Data Officer who will oversee data governance practices, implement strict access controls, and conduct regular audits to ensure compliance with privacy regulations, such as HIPAA.

#### Step 4. Collaborate with AI Experts

Engage in partnerships with AI technology vendors, research institutions, and academic centers to tap into their expertise. Collaborative efforts can accelerate the development and implementation of AI solutions. For example, a healthcare company may collaborate with a leading AI research institute to explore the use of Natural Language Processing algorithms for extracting valuable insights from clinical notes and medical literature.

#### Step 5. Leverage Machine Learning Algorithms

Utilize Machine Learning algorithms to analyze vast amounts of healthcare data and generate meaningful insights. This can enable predictive analytics, risk stratification, and personalized treatment recommendations. For example, a healthcare provider may deploy Machine Learning algorithms to analyze patient data—including demographic information, medical history, and diagnostic tests—to identify high-risk individuals who may benefit from early intervention programs.

#### Step 6. Implement Natural Language Processing (NLP)

Integrate NLP technologies to extract and interpret unstructured data from clinical notes, research papers, and patient feedback. NLP can enhance clinical decision support systems and facilitate efficient information retrieval. For example, a healthcare organization may adopt an NLP-powered system that will analyze electronic health records to extract relevant information for clinical research studies, improving data accessibility and research efficiency.

#### Step 7. Drive Clinical Decision Support

Develop AI-driven clinical decision support systems that provide evidence-based recommendations, alert clinicians to potential risks, and assist in treatment planning. These systems can enhance diagnostic accuracy and improve patient outcomes. For example, a healthcare company may implement a clinical deci-

sion support system that will utilize AI algorithms to analyze patient symptoms, medical history, and diagnostic tests to provide real-time treatment recommendations to physicians.

#### Step 8. Enable Remote Patient Monitoring

Utilize AI-enabled remote monitoring devices to track patient health outside of traditional healthcare settings. These devices can collect vital signs, detect anomalies, and enable timely interventions. For example, a home healthcare agency may introduce AI-powered wearable devices that will continuously monitor patients with chronic conditions, such as heart disease or diabetes, enabling remote patient monitoring and early detection of health issues.

#### Step 9. Ensure Ethical and Transparent AI Use

Promote the ethical and responsible use of AI in healthcare. Develop guidelines and frameworks that address concerns such as algorithmic bias, privacy protection, transparency, and accountability. Engage in transparent communication with patients and healthcare professionals about the implementation and benefits of AI. For example, a healthcare organization may establish an AI ethics committee that will oversee the development and deployment of AI technologies. The committee conducts regular audits, monitors algorithmic fairness, and ensures compliance with ethical guidelines and regulatory standards.

#### Step 10. Continuous Evaluation and Improvement

Continuously assess the impact and effectiveness of AI applications in healthcare. Monitor performance metrics, collect feedback from stakeholders, iterate on processes to improve outcomes, address challenges, and refine AI initiatives. For example, a healthcare company regularly measures the impact of AI applications on patient outcomes, clinician satisfaction, and operational efficiency. They will actively seek feedback from healthcare professionals and patients to identify areas of improvement and make necessary adjustments.

## HOSPITALITY

### The Impact of AI in the Hospitality Industry

From personalized guest experiences to operational efficiency, AI is transforming various aspects of the industry. One of the primary areas where AI is making a significant impact is in delivering personalized and exceptional guest experiences. Leading hotel chains are leveraging AI-powered chatbots and virtual assistants to provide 24/7 customer support and assistance. For instance, Marriott International implemented an AI-powered chatbot called “ChatBotlr” to enhance guest services by answering common queries, suggesting local attractions, and providing personalized recommendations. As of today, Marriott International’s ChatBotlr has already successfully handled millions of guest interactions, improved response times, and enhanced overall guest satisfaction.

AI is playing a crucial role in revenue management and price optimization within the hospitality industry. By analyzing vast amounts of data, AI algorithms can identify patterns, market trends, and customer behavior to optimize pricing strategies and maximize revenue. Companies like Hilton have implemented AI-powered revenue management systems that dynamically adjust prices based on demand, occupancy rates, and other factors. Hilton’s AI-based revenue management system has led to a significant increase in revenue by accurately predicting demand and optimizing pricing strategies across their properties.

AI technologies are also playing a crucial role in enhancing safety and security within the hospitality industry. Facial recognition systems and AI-powered video analytics are being used for surveillance, access control, and threat detection. By analyzing facial features and behavior patterns, these systems can identify potential security risks and enhance overall safety for guests and staff. For example, Wynn Las Vegas has implemented an AI-powered surveillance system that uses facial recognition and video

analytics to identify persons of interest and prevent security incidents, leading to a safer environment for guests and employees.

There are many tangible benefits in AI adoption by the hospitality industry, yet the industry is embracing AI technologies very slowly. As AI continues to advance, its potential impact on the hospitality industry is vast, promising a future of personalized and efficient services that will shape the industry's landscape.

### Hospitality: Where to Start From

In the dynamic world of hospitality, Artificial Intelligence will change guest experiences, streamline operations, and enhance overall efficiency. Whether you're managing a boutique hotel or overseeing a global hospitality chain, starting the AI Transformation is a strategic imperative. The first step is to assess your unique needs and goals.

While AI holds immense potential for the hospitality sector, it's vital to recognize that not all AI solutions are one-size-fits-all. Begin by conducting a thorough assessment of your specific requirements and objectives. Here are five tailored starting points to consider.

#### 1. Personalized guest experiences:

Identify opportunities to enhance guest experiences through AI-driven personalization. Implement AI chatbots and virtual concierges to cater to guest preferences, offer tailored recommendations, and streamline check-in/check-out processes.

#### 2. Revenue optimization:

Evaluate ways to optimize revenue using AI-powered pricing and demand forecasting algorithms. These solutions can help maximize room occupancy rates and pricing strategies based on market dynamics.

3. Enhanced guest safety and security:

Invest in AI systems for guest safety and security. Utilize AI-based surveillance and facial recognition systems to enhance security measures and ensure the safety of guests and staff.

4. Operational efficiency:

Streamline hotel operations using AI. Implement AI-powered systems for inventory management, housekeeping scheduling, and energy consumption optimization, reducing operational costs.

5. Data-driven insights:

Leverage AI for data analytics and insights. Analyze guest feedback, reviews, and preferences to make informed decisions, identify trends, and continuously improve service quality.

From AI-powered room service robots to smart room controls, the transformative AI applications are plenty. The AI Transformation begins with a commitment to providing better guest experiences while optimizing operations with the power of AI.

## Ten AI Applications For the Hospitality Industry

The hospitality industry has always been at the forefront of innovation by constantly seeking ways to enhance guest experiences and streamline operations. In recent years, the integration of Artificial Intelligence applications has brought about a transformative shift, presenting new opportunities for hotels and resorts. From immersive virtual experiences to intelligent robotic staff, AI is reshaping the hospitality landscape.

1. Virtual Reality for immersive experiences:

VR is changing the way guests experience hospitality. By transporting individuals to virtual environments, hotels can provide immersive experiences that go beyond traditional offerings. Guests can take virtual tours of hotel rooms and facilities,

explore destinations, and even partake in interactive activities. For instance, Marriott Hotels has introduced “VRRoom Service,” allowing guests to request a VR headset to explore virtual travel destinations from the comfort of their rooms.

## 2. Intelligent robotic staff:

The integration of intelligent robotic staff is transforming hotel operations and guest services. Robots equipped with AI capabilities can assist with check-ins, provide recommendations, deliver room service, and perform routine tasks—freeing up human staff to focus on more complex guest needs. An excellent example is Henn-na Hotel in Japan, which employs robot concierges and robot porters to enhance efficiency and guest experiences.

## 3. Hyper-personalization:

Hyper-personalization leverages AI algorithms to tailor guest experiences based on individual preferences, previous stays, and real-time context. Hotels can provide personalized recommendations for dining options, suggest activities based on guests’ interests, and customize in-room amenities. Hilton Hotels’ “Connected Room” initiative allows guests to control room features through a mobile app to create a personalized and convenient stay.

## 4. AI-driven dynamic pricing:

AI algorithms are transforming pricing strategies in the hospitality industry. By analyzing real-time data, market trends, and customer demand, hotels can dynamically adjust prices to optimize revenue generation. This approach ensures competitive pricing while maximizing occupancy rates. Leading hotel chains, such as AccorHotels, utilize AI-driven dynamic pricing solutions to stay ahead in a highly competitive market.

## 5. Sentiment analysis for reputation management:

AI-powered sentiment analysis tools help hotels monitor and manage their online reputation. By analyzing customer

reviews, social media mentions, and feedback, hotels can gauge guest sentiment, identify areas for improvement, and respond promptly to customer concerns. ReviewPro, a reputation management platform, employs AI algorithms to analyze customer feedback and sentiment across various online platforms.

#### 6. Voice-activated smart rooms:

Voice-activated smart rooms offer guests a seamless and personalized experience. AI-powered voice assistants, such as Amazon's Alexa or Google Assistant, enable guests to control room amenities, request services, and access information through voice commands. Wynn Las Vegas has implemented Amazon Echo devices in its rooms, allowing guests to control lights, curtains, and entertainment systems using voice commands.

#### 7. AI-enabled sustainability practices:

The hospitality industry is increasingly focusing on sustainable practices, and AI plays a crucial role in optimizing resource consumption and reducing environmental impact. AI algorithms analyze data to identify energy waste, optimize energy usage, and promote eco-friendly initiatives. The Costa Group, a leading cruise line, utilizes AI to optimize onboard energy consumption and reduce emissions.

#### 8. Emotion recognition for guest experience:

Emotion recognition technology enables hotels to understand and respond to guest emotions in real-time. By analyzing facial expressions and vocal cues, AI algorithms can gauge guest satisfaction, detect potential issues, and deliver personalized experiences. Emotion AI startups like Affectiva are developing solutions that can analyze guest emotions during interactions, allowing hotels to provide tailored experiences and address concerns promptly.

### 9. AI-powered smart concierge:

AI-powered smart concierge systems enhance guest experiences by providing personalized recommendations, real-time assistance, and anticipating guest needs. These systems leverage AI algorithms to analyze guest data, preferences, and historical patterns to offer customized suggestions and enhance engagement. The Cosmopolitan of Las Vegas has introduced “Rose,” an AI-powered chatbot concierge that assists guests with recommendations and bookings.

### 10. AI-enhanced security and safety:

AI technologies are transforming security and safety measures in the hospitality industry. AI-powered surveillance systems equipped with facial recognition capabilities can detect and flag suspicious activities to ensure guest safety. Additionally, AI algorithms can analyze data from IoT devices to identify potential hazards and proactively address them. Crowne Plaza Changi Airport in Singapore utilizes AI-based surveillance systems to enhance security and prevent unauthorized access.

AI applications are revolutionizing the hospitality industry by enabling hotels to provide enhanced guest experiences, optimize operations, and stay competitive in a rapidly evolving market. From immersive VR experiences and intelligent robotic staff to hyper-personalization and AI-driven dynamic pricing, these applications offer a glimpse into the future of hospitality. By embracing AI technologies, hotels can create memorable experiences, improve efficiency, and foster guest loyalty in an increasingly interactive era.

## Embracing AI Hospitality

The hospitality industry is experiencing a dynamic landscape characterized by intense competition and evolving guest expectations. AI can empower the industry to overcome challenges, seize opportunities, and preserve a high-quality guest experience.

These are the three key reasons why I believe that the adoption of AI is crucial for the hospitality industry, and the threats and opportunities that lie ahead.

1. Staying competitive in a cutthroat market:

The hospitality market has become increasingly competitive, with new entrants and disruptive business models reshaping the industry. To differentiate themselves, hotels need to leverage AI applications that enhance guest experiences and optimize operational efficiency. AI-powered technologies, such as Virtual Reality for immersive experiences, hyper-personalization, and AI-driven dynamic pricing, provide unique selling points and attract discerning guests who seek innovative and personalized stays.

Opportunity:

By embracing AI, hotels can create exceptional guest experiences, gain a competitive edge, and position themselves as industry leaders. Leveraging AI applications that align with their brand and target audience will help hotels stand out in a crowded marketplace and attract tech-savvy, experience-driven travelers.

Threat:

Competitors who embrace AI may outperform traditional hotels in terms of guest satisfaction, operational efficiency, and revenue generation. Without AI-driven innovation, hotels risk becoming obsolete and losing relevance in the evolving market.

2. Optimizing operational efficiency:

Efficiency is a critical factor for success in the hospitality industry. AI applications offer tremendous potential to streamline operations, reduce costs, and enhance overall efficiency. Intelligent robotic staff, automated customer feedback analysis, AI-powered revenue forecasting, and predictive maintenance systems are

examples of AI-driven solutions that will change hotel operations.

**Opportunity:**

AI-driven automation and optimization enable hotels to streamline processes, minimize manual labor, and allocate resources more efficiently. Intelligent robotic staff can handle routine tasks, freeing up human employees to focus on providing personalized and exceptional guest service. AI-powered revenue forecasting ensures optimal pricing strategies, maximizing revenue and occupancy rates. Predictive maintenance systems prevent equipment failures, minimize downtime, and reduce operational costs.

**Threat:**

Hotels that fail to embrace AI technologies may struggle to meet rising guest expectations for efficiency and personalized services. Manual and outdated processes can lead to inefficiencies, increased costs, and potential service gaps. Competitors who successfully integrate AI applications will outpace traditional hotels by offering superior operational efficiency and cost-effectiveness.

**3. Preserving quality amidst technological disruption:**

As technology advances, guest expectations continue to evolve. AI applications enable hotels to deliver exceptional guest experiences without compromising on quality. Sentiment analysis for reputation management, voice-activated smart rooms, emotion recognition, and AI-powered smart concierges are examples of AI technologies that elevate the quality of service while incorporating cutting-edge innovations.

**Opportunity:**

AI-powered sentiment analysis tools help hotels monitor online reputation, enabling proactive responses to guest feedback and concerns. Voice-activated smart rooms

offer convenience and personalization, enhancing guest comfort and satisfaction. Emotion recognition technology allows hotels to understand and respond to guest needs by delivering tailored experiences that foster emotional connections. AI-powered smart concierges provide personalized recommendations and 24/7 assistance, further enhancing guest experiences.

#### Threat:

Failing to adopt AI applications may result in a decline in service quality and guest satisfaction. Without AI-driven innovations, hotels risk falling behind in meeting guests' ever-increasing expectations. Disruptive competitors who integrate AI successfully may offer superior quality experiences and gain a competitive advantage.

Embracing AI is no longer a choice, but a strategic imperative for the hospitality industry. The convergence of intense competition, evolving guest expectations, and technological advancements necessitates the adoption of AI applications. By leveraging AI, hotels can differentiate themselves, optimize operations, and deliver exceptional guest experiences. The opportunities presented by AI, such as staying competitive, optimizing efficiency, and preserving quality, far outweigh the threats of falling behind and losing market share. To secure a prosperous future, hospitality industry stakeholders must embrace AI as a transformative force that will shape the industry and redefine the guest experience.

#### A 10 Step Guide to an AI-Friendly Hospitality Company

The hospitality industry is undergoing a significant transformation with the integration of AI technologies. From personalized guest experiences to efficient operations, AI has the potential to revolutionize the way hotels, resorts, and other hospitality

businesses operate. To harness the full benefits of AI and create an AI-friendly environment, hospitality companies should follow these ten steps:

### Step 1. Define AI Objectives and Strategy

Start by defining clear objectives for AI adoption in the hospitality business. Determine how AI can improve guest experiences, streamline operations, and optimize revenue. Develop a comprehensive strategy outlining the specific AI applications and technologies to be implemented. For example, a hotel may set an objective to enhance guest experiences through AI-driven personalization. Their strategy will include implementing chatbots for instant customer service, AI-powered recommendation systems, and smart room automation to create a seamless and personalized stay for guests.

### Step 2. Assess Data Availability and Quality

Evaluate the availability and quality of data within the organization. Identify relevant data sources such as customer profiles, booking patterns, feedback, and social media data. Ensure data is accurate, comprehensive, and properly structured for AI algorithms to derive meaningful insights. For example, a resort may conduct a thorough data audit to assess the availability and quality of guest data. They will integrate their reservation system, loyalty program, and customer feedback platform to create a centralized data repository for AI analysis.

### Step 3. Invest in Data Analytics Infrastructure

Invest in robust data analytics infrastructure to support AI initiatives. This includes cloud-based platforms, data storage, and processing capabilities. Leverage advanced analytics tools and technologies such as Machine Learning and Natural Language Processing to extract valuable insights from data. For example, a resort may migrate its data infrastructure to a cloud-based platform, enabling scalable storage and processing capabilities. It will

leverage AI-powered analytics tools to analyze customer data and gain actionable insights for personalized marketing campaigns.

#### Step 4. Enhance Guest Engagement with Chatbots

Implement AI-powered chatbots to enhance guest engagement and streamline customer service. Chatbots can handle common queries, provide recommendations, process bookings, and offer personalized assistance—all while available 24/7. This reduces response times and improves guest satisfaction. For example, a hotel may deploy chatbots on their website and messaging platforms to assist guests with inquiries, room bookings, and local recommendations. The chatbots will be programmed to provide accurate and personalized responses to offer a seamless guest experience.

#### Step 5. Personalize Guest Experiences

Utilize AI algorithms to personalize guest experiences throughout their journey. By analyzing guest preferences, behavior, and historical data, AI can recommend personalized offers, amenities, and services. This creates a tailored and memorable experience for each guest. For example, a resort may use AI-driven recommendation systems to suggest personalized activities, dining options, and room upgrades based on guest preferences. It will send targeted offers and promotions via email and mobile apps to enhance guest satisfaction and drive revenue.

#### Step 6. Implement Revenue Management Solutions

Integrate AI-based revenue management solutions to optimize pricing, demand forecasting, and inventory management. AI algorithms can analyze market trends, competitor pricing, historical data, and booking patterns to determine optimal pricing strategies and maximize revenue. For example, a hotel may adopt a revenue management system powered by AI to dynamically adjust room rates based on demand, seasonality, and market conditions. It will allow them to optimize occupancy rates and maximize revenue per available room.

### Step 7. Enhance Operational Efficiency with AI

Implement AI applications to streamline operational processes and improve efficiency. AI-powered systems can automate tasks such as housekeeping scheduling, inventory management, and maintenance tracking. This reduces manual effort, increases productivity, and minimizes errors. For example, a resort may integrate an AI-driven housekeeping management system that optimizes room cleaning schedules based on guest check-ins, check-outs, and preferences. The system will assign tasks to housekeeping staff, track progress in real-time, and automatically adjust schedules based on changing priorities.

### Step 8. Improve Security and Safety with AI

Utilize AI technologies to enhance security and safety measures within the hospitality environment. AI-powered video surveillance systems can detect anomalies, identify potential threats, and alert security personnel in real-time. AI algorithms can also analyze guest behavior patterns to identify suspicious activities. For example, a hotel may install AI-powered video surveillance cameras throughout their premises to monitor and detect unusual behavior or security breaches. The system will use facial recognition technology to identify known employees and will raise alerts for unrecognized individuals.

### Step 9. Embrace Voice and Gesture Control

Integrate voice and gesture recognition technologies to enable seamless and intuitive interactions for guests. Voice-activated assistants in guest rooms can control lighting, temperature, and entertainment systems—while gesture control systems in public spaces offer touchless experiences. For example, a resort may equip guest rooms with voice-activated assistants that allow guests to control room settings, request services, and access information using simple voice commands. Public areas, such as conference rooms or fitness centers, will be equipped with gesture control systems for touchless interactions.

### Step 10. Foster AI Talent and Culture

Invest in AI talent and create a culture that embraces AI innovation. Hire data scientists, AI experts, and technologists to lead AI initiatives. Provide training and development opportunities to employees to enhance their understanding of AI technologies and foster a collaborative environment. For example, a hospitality company may recruit a dedicated AI team consisting of data scientists, AI engineers, and hospitality experts. They will conduct regular workshops and training sessions for employees to enhance their knowledge of AI applications and encourage cross-department collaboration.

## RETAIL

### Selling the AI Transformation to Retail Companies

Retailers are facing increasing pressure to provide personalized shopping experiences to consumers in order to remain competitive in the digital age. AI is well-suited to help retailers meet this demand by analyzing customer data and providing personalized product recommendations and advertising. According to a survey by Salesforce, 64 percent of consumers expect personalized offers from retailers and 73 percent are willing to share their data if it results in a more personalized shopping experience.

One example of AI in the retail industry is Amazon's recommendation engine, which uses AI algorithms to provide personalized product recommendations to shoppers based on their purchase history and browsing behavior. This technology has been a key driver of Amazon's success, accounting for 35 percent of the company's revenue. Andy Jassy, the CEO of Amazon Web Services, emphasizes the significance of AI in retail, stating, "AI has the potential to revolutionize how retailers analyze vast amounts of customer data, predict purchasing patterns, and offer personalized recommendations." Other retailers, such as Sephora and Nike, have also implemented AI-powered recommendation

engines to personalize the shopping experience for their customers. AI can also be used to improve inventory management and supply chain efficiency. By analyzing data on sales trends and inventory levels, retailers can better predict demand and ensure that they have the right products in stock at the right time. This can help to reduce waste and improve profitability. For example, fashion retailer Zara uses AI to analyze customer data and sales trends to optimize inventory and reduce overstocking.

Emerging technologies—such as experience reality and IoT smart objects—have the potential to transform the retail industry by creating immersive shopping experiences for customers and improving customer satisfaction. In addition to these benefits, AI and emerging technologies can also help retailers to reduce costs and increase efficiency. For example, Walmart is currently using AI-powered robots to scan shelves and check inventory levels, reducing the need for human workers to perform these tasks. This technology has helped Walmart to reduce labor costs and improve efficiency.

### Retail: Where to Start From

Artificial Intelligence will change customer experiences, optimize operations, and drive business growth. Whether you're a brick-and-mortar store or an e-commerce giant, the AI Transformation is a strategic necessity, and the first step is to assess your specific needs and goals.

Here are five starting points to consider:

#### 1. Personalized shopping experiences:

Identify opportunities to enhance customer experiences through AI-driven personalization. Implement AI recommendation engines that analyze customer data to offer tailored product recommendations, improving conversion rates and customer satisfaction.

2. Inventory management and demand forecasting:

Optimize inventory management using AI. Utilize AI algorithms to forecast demand, reduce excess inventory, and minimize stockouts, ultimately improving supply chain efficiency.

3. Loss prevention and security:

Invest in AI-driven security systems to prevent theft and enhance store security. AI-powered video analytics can detect suspicious activities and alert security personnel in real-time.

4. Customer service and support:

Enhance customer service with AI chatbots and virtual assistants. These AI-driven solutions can handle routine customer inquiries, freeing up human staff for more complex tasks and improving response times.

5. Price optimization:

Implement AI-powered pricing strategies. Use AI to analyze market dynamics, competitor pricing, and customer behavior to set optimal prices and maximize profits.

From cashier-less stores to AI-powered inventory drones, there many AI applications that you can already try. The AI Transformation shall begin with a commitment to provide great shopping experiences while optimizing retail operations.

## Ten AI Applications For the Retail Industry

With a focus on enhancing customer experiences and optimizing operations, AI Transformation is reshaping how retailers operate. From personalized shopping recommendations to cashier-less stores, AI applications are already changing the retail industry to make shopping smarter and more convenient than ever before.

Here are ten applications that I recommend.

### 1. Hyper-personalization:

In the future, AI applications will enable retailers to offer hyper-personalized experiences to customers. By analyzing vast amounts of customer data—including browsing behavior, social media activity, and purchase history—AI algorithms will provide tailored recommendations, personalized advertisements, and customized pricing. For example, a clothing retailer could use AI to suggest outfits based on the customer’s style preferences, body type, and occasion. This level of personalization will create more meaningful connections with customers, enhance their shopping experiences, and increase customer loyalty.

### 2. Augmented Reality shopping:

The combination of AR technology and AI will change the way customers shop. AI algorithms will allow customers to visualize products in a virtual environment before making a purchase. For example, customers can virtually try on clothes, visualize furniture in their homes, or even test cosmetic products on their faces. This immersive shopping experience will improve customer confidence in their purchasing decisions and reduce the likelihood of returns. Retailers will benefit from increased customer engagement, higher conversion rates, and reduced operational costs associated with product returns.

### 3. Voice-activated shopping:

Voice-activated AI assistants will become a prominent feature in retail, allowing customers to place orders, inquire about product information, and make purchases using voice commands. Retailers can leverage this technology to offer seamless and convenient shopping experiences, while expanding their reach to customers who prefer voice interaction. For example, a customer could say, “Order a pair of running shoes in size 9,” and the AI assistant would facilitate the purchase. This technology enhances accessibility, streamlines the shopping process, and improves customer satisfaction.

#### 4. Automated checkout:

AI-powered checkout systems will eliminate the need for traditional cashiers. Computer vision technology combined with AI algorithms will enable automated scanning and payment processes. Customers can simply place items in a cart and the system will automatically detect, scan, and charge for the items—minimizing queues and reducing waiting times. Automated checkout systems improve efficiency, reduce labor costs, and enhance the overall customer experience by providing a fast and seamless checkout process.

#### 5. Robotics in warehousing and logistics:

AI-driven robots will play a significant role in transforming warehousing and logistics operations. These robots will handle tasks such as inventory management, picking and packing, and autonomous delivery. For example, robots equipped with computer vision can navigate warehouses, locate products, and organize them for shipment. By streamlining operations and reducing human intervention, retailers will achieve faster order fulfillment, lower operational costs, and improved accuracy in inventory management.

#### 6. Smart supply chain management:

Future AI applications will optimize supply chain management by leveraging Machine Learning algorithms to analyze and predict demand patterns, optimize inventory levels, and automate supplier management. AI will enable retailers to make data-driven decisions that enhance efficiency, reduce costs, and improve agility in responding to market demands. For example, AI algorithms can analyze sales data, seasonal trends, and customer preferences to optimize inventory levels and prevent stockouts or excess inventory.

#### 7. AI-driven dynamic pricing:

AI algorithms will enable retailers to implement dynamic

pricing strategies that adapt in real-time based on market conditions, competitor prices, and customer behavior. By leveraging AI, retailers can optimize pricing decisions to maximize revenue, improve profit margins, and remain competitive in a dynamic market. For example, an e-commerce platform can adjust prices based on factors like supply and demand fluctuations, customer segmentation, and competitor pricing strategies.

#### 8. Emotion AI for customer sentiment analysis:

Future AI applications will include emotion recognition technology that allows retailers to gauge customer sentiment and emotions in real-time. By analyzing facial expressions, voice tones, and other behavioral cues, retailers can personalize interactions, resolve customer issues promptly, and create emotionally engaging experiences. For example, a customer's facial expression may indicate frustration during an online chat session, prompting an AI assistant to escalate the issue and provide appropriate assistance.

#### 9. Predictive analytics for sustainable practices:

AI-powered predictive analytics will help retailers make data-driven decisions to adopt sustainable practices. By analyzing data related to energy consumption, waste management, and carbon footprint, retailers can identify areas for improvement and implement sustainable initiatives. For example, AI algorithms can identify energy-efficient operations, recommend eco-friendly packaging alternatives, and optimize transportation routes to reduce the environmental impact while maintaining profitability.

#### 10. Intelligent virtual assistants:

Future AI applications will introduce advanced virtual assistants with advanced Natural Language Processing capabilities, context-awareness, and Deep Learning algorithms. These intelligent virtual assistants will understand customer needs, engage in meaningful conversations, and provide personalized recommen-

dations. They will serve as valuable shopping companions that assist customers throughout their shopping journey. For example, an intelligent virtual assistant could suggest relevant products, provide detailed product information, and answer customer inquiries to create a personalized and efficient shopping experience.

## Reinventing Retail with AI

AI technologies offer many opportunities for retailers to optimize operations, enhance customer experiences, and drive revenue growth. These are the three key reasons why I believe that the retail industry should embrace AI.

### 1. Personalize customer experiences:

AI enables retailers to deliver personalized experiences tailored to each customer's preferences and needs. By leveraging AI algorithms, retailers can analyze vast amounts of customer data, including browsing behavior, purchase history, and social media activity, to gain valuable insights. Personalization fosters deeper customer engagement, strengthens brand loyalty, and increases customer satisfaction.

### Opportunities:

These insights empower retailers to provide personalized recommendations, customized advertisements, and targeted promotions.

### Threats:

One threat is the risk of infringing on customer privacy. Collecting and analyzing extensive customer data can raise concerns about data security and misuse. Retailers must prioritize data protection, comply with privacy regulations, and be transparent with customers about their data usage. Failure to do so can erode trust and damage the brand reputation.

Another threat lies in striking the right balance between personalization and intrusiveness. Over-personalization can lead to customers feeling overwhelmed or even stalked by targeted advertisements. Retailers must find the fine line between providing relevant recommendations and respecting customers' boundaries. Opt-in mechanisms, clear consent policies, and customizable privacy settings can help mitigate this threat.

## 2. Operational efficiency and cost optimization:

Automation enhances operational efficiency, minimizes errors, and reduces labor costs. For example, AI-powered demand forecasting can improve inventory management, ensuring the right products are available at the right time and location. This reduces costs associated with overstocking or stockouts. Additionally, AI-driven automation can handle repetitive tasks like inventory tracking, data entry, and customer support, freeing up Human Resources to focus on higher-value activities.

### Opportunities:

AI-driven automation can streamline routine tasks such as inventory management, replenishment, and supply chain logistics. By automating these processes, retailers can reduce manual labor, minimize errors, and significantly improve efficiency.

AI can optimize operations through demand forecasting, helping retailers anticipate customer preferences and adjust inventory levels accordingly. This reduces excess inventory, mitigates stockouts, and ultimately results in cost savings.

Chatbots and virtual assistants powered by AI can handle routine customer inquiries, which frees up human staff for more complex tasks and reducing labor costs.

AI-driven data analytics provide valuable insights into consumer behavior and market trends, allowing retailers to make informed decisions in real-time. This data-driven approach enhances inventory management, pricing strategies, and marketing efforts that ultimately reduces operational costs and increases profitability.

#### Threats:

Retailers need to proactively address potential job displacement and ensure a smooth transition for employees. Workforce re-skilling and up-skilling programs can help employees acquire new skills and adapt to the evolving retail landscape. Retailers must foster a culture that embraces technology and empowers employees to work alongside AI systems by emphasizing the role of humans in decision making and customer interactions. Another threat is the risk of overreliance on AI systems without human oversight. While AI algorithms can optimize processes, they are not infallible. Errors or biases in AI algorithms can lead to incorrect recommendations, inaccurate demand forecasts, or discriminatory practices. Retailers must continuously monitor and evaluate AI systems to ensure they align with ethical standards and comply with regulations to avoid reputation damage and legal repercussions.

#### 3. Enhanced Data-Driven Decision Making:

AI empowers retailers with advanced analytics capabilities that enables Data-Driven Decision Making across various aspects of the business. AI algorithms can analyze large volumes of data, uncover patterns, and generate actionable insights. By leveraging AI, retailers can make informed decisions, anticipate customer needs, and excel in a highly competitive market.

#### Opportunities:

Through constant analysis of market dynamics, com-

petitor pricing, and real-time customer behavior, retailers can implement dynamic pricing strategies that maximize profitability while staying competitive.

By scrutinizing sales data and customer preferences, businesses can stock items that align more closely with their target audience to reduce inventory costs and increase customer satisfaction.

AI will drive personalized marketing campaigns by tailoring efforts to individual customer profiles. This will result in higher engagement and conversion rates, as customers receive content and offers that are specifically relevant to them.

By analyzing vast datasets and customer feedback, retailers can proactively adapt to market shifts and evolving customer expectations to ensure that they stay ahead of the curve.

AI Transformation will offer retailers the tools to make data-driven decisions that improve pricing, product assortment, marketing effectiveness, and trend identification.

#### Threats:

One key threat associated with Data-Driven Decision Making is the quality and integrity of data. Retailers need to ensure data accuracy, reliability, and completeness to derive meaningful insights. Poor data quality can lead to flawed analysis and misguided decision making. Implementing robust data governance practices, data cleansing techniques, and data validation processes can help mitigate this threat.

Another challenge is data privacy and security. With

increased reliance on Data-Driven Decision Making, protecting sensitive customer information becomes paramount. Retailers must invest in robust cybersecurity measures, encrypt data, and establish protocols for secure data storage and transmission. Breaches in data security can have severe consequences, including financial losses, reputation damage, and legal implications.

Personalized customer experiences, operational efficiency, and enhanced Data-Driven Decision Making are just a few of the benefits AI can offer. However, retailers must be pragmatic and address the associated challenges and threats.

## A 10 Step Guide to an AI-Friendly Retail Company

Artificial Intelligence has become a game-changer in the retail industry, transforming the way companies operate and interact with customers. These are the ten steps that I believe retail companies should follow to navigate the AI landscape effectively.

### Step 1. Define Clear Objectives

Start by defining clear objectives for integrating AI into your retail operations. Identify specific areas where AI can make a significant impact, such as customer personalization, inventory management, or supply chain optimization. For example, online fashion retailer Stitch Fix uses AI algorithms to deliver personalized styling recommendations based on customer preferences, leading to increased customer satisfaction and repeat purchases.

### Step 2. Assess Data Availability and Quality

Evaluate the availability and quality of your data. AI relies on accurate and diverse data for training models and generating meaningful insights. Conduct a comprehensive data audit to identify gaps and ensure your data is clean, structured, and relevant. Walmart, for instance, leverages its vast dataset to power AI algo-

rithms that optimize inventory levels to minimize stockouts and improve efficiency.

### Step 3. Build the Right Talent Pool

Assemble a team of AI experts who possess the necessary skills and expertise. This includes data scientists, Machine Learning engineers, and AI strategists. Retail giant Amazon actively recruits AI talent and employs thousands of data scientists and engineers to develop cutting-edge AI solutions for their operations, such as their cashier-less Amazon Go stores.

### Step 4. Invest in Infrastructure

Ensure you have the infrastructure to support AI implementation. This includes powerful hardware, robust cloud computing capabilities, and scalable storage solutions. Retail companies like Sephora leverage cloud-based AI platforms to process and analyze vast amounts of customer data in real-time to enable personalized product recommendations and targeted marketing campaigns.

### Step 5. Embrace Machine Learning

Explore Machine Learning algorithms to extract valuable insights from your data. Develop AI models that can predict customer behavior, optimize pricing strategies, or detect fraudulent activities. E-commerce giant eBay utilizes Machine Learning algorithms to deliver personalized search results and recommendations that improve the overall customer experience.

### Step 6. Leverage Natural Language Processing (NLP)

Implement Natural Language Processing techniques to understand and respond to customer inquiries effectively. Chatbots powered by NLP can handle customer queries, provide product information, and even assist with purchasing decisions. For example, beauty retailer Sephora uses an AI chatbot on their website and mobile app to offer personalized beauty recommendations based on customer inquiries.

### Step 7. Enhance Customer Experience with Computer Vision

Harness the power of computer vision to enhance the customer experience. Implement image recognition technology to enable visual search capabilities that allow customers to find products by simply uploading images. This technology has been successfully implemented by retailers like ASOS to allow customers to search for clothes and accessories using images from magazines or social media.

### Step 8. Implement Predictive Analytics

Utilize predictive analytics to forecast customer demand, optimize inventory levels, and improve supply chain efficiency. By analyzing historical data and market trends, retail companies can anticipate customer preferences, ensure product availability, and minimize excess inventory. Walmart uses predictive analytics to optimize their supply chain, which reduces costs and improves overall operational efficiency.

### Step 9. Secure Customer Data and Privacy

Prioritize data security and privacy to build customer trust. Implement robust security measures and comply with regulations such as the General Data Protection Regulation (GDPR). Retailers like Apple prioritize customer privacy by using on-device AI processing to analyze user data, ensuring data remains secure and confidential.

### Step 10. Continuously Monitor and Adapt

Monitor the performance of your AI systems and be prepared to adapt as the retail landscape and technology evolve. Continuously evaluate the effectiveness of your AI applications and make adjustments as needed. Stay updated on the latest advancements in AI and explore new opportunities for innovation. Retail companies like Nike regularly monitor the performance of their AI-powered customer engagement tools and adapt their strategies

to meet changing customer expectations.

### One Last Thing...

You are almost ready to go, but first you need to manage change and overcome resistance to AI implementation. The key lies in involving employees, addressing concerns, and showcasing the value and benefits of AI technology.

These are key strategies that I recommend to navigate this process effectively:

#### 1. Communicate the vision:

Clearly articulate the benefits and value of AI implementation to all stakeholders, including employees, managers, and executives. Explain how AI can enhance productivity, streamline processes, and drive innovation. Address any concerns or misconceptions to build understanding and buy-in.

#### 2. Strengthen a culture of learning and adaptability:

Encourage a growth mindset within the organization, emphasizing the importance of continuous learning and development. Offer training programs, workshops, and resources to help employees upskill and adapt to new technologies. Provide a supportive environment that encourages experimentation and rewards innovation.

#### 3. Involve employees in the process:

Engage employees early on and involve them in the AI Transformation process. Seek their input, ideas, and feedback to create a sense of ownership and collaboration. Encourage cross-functional teams to work together, breaking down silos and promoting a culture of collaboration.

#### 4. Address concerns and build trust:

Address concerns and fears related to job displacement

or loss. Communicate how AI will augment human capabilities rather than replace them, freeing up time for more strategic and creative tasks. Emphasize the importance of human judgment and decision making in conjunction with AI technologies. Establish transparent policies and guidelines to ensure fairness, privacy, and ethical use of AI.

5. Start small and show success:

Begin with pilot projects or smaller-scale AI implementations to demonstrate tangible benefits. Highlight early successes stories to build confidence and enthusiasm. Gradually scale up AI initiatives based on lessons learned and positive outcomes.

Stop Booking Me, DIY

As you know I am a keynote speaker.

I travel across continents to give speeches. I am hired by companies to talk to their clients and partners about how and why they are aligned to the future and to talk with their organizations about their innovative visions and change.

For a while, all my clients have asked me to talk to their organizations about AI and defeat their reluctance to embrace it. These last two chapters were “how to,” so let me tell you how to avoid hiring me and talk directly to your organization about the importance to welcome the AI Transformation.

Here is my suggested speech from a leader to announce AI Transformation to his reluctant organization.

“Dear team,

Good morning! I want to take a moment to discuss an important topic that will shape the future of our company: the introduction of Artificial Intelligence.

I understand that change can be intimidating, especially when it comes to new technologies like AI. But I want to assure you that our approach to AI will benefit each and every one of you.

First and foremost, I want you to know that our goal is to make our company even more successful and create new opportunities for growth. Embracing AI will help us streamline our processes, increase efficiency, and remain competitive in the market.

But let's address the elephant in the room: the fear of downsizing. I want to emphasize that AI is not here to replace you; it is here to amplify your potential. It's not about replacing anyone; it's about empowering all of us to do our best work and to unlock our full potential.

To make this transition as smooth as possible, we will take a bottom-up approach. This means that we value your expertise and insights in identifying areas where AI can make a positive impact. Each department will have the opportunity to explore AI solutions that address their specific needs and challenges.

In addition, I am pleased to announce the formation of an Ethical Committee. This committee will include representatives from all levels of the organization, ensuring that every voice is heard. Their role will be to ensure that our AI systems are fair, unbiased, and aligned with our core values. They will make sure that AI is a tool for progress, not a source of concern. They will also monitor the impact on job roles and employee well-being, advocating for fairness and equity.

I want to emphasize that your roles are essential and will not be replaced by AI. Instead, AI will support you by automating repetitive tasks, freeing up your time to focus on more meaningful and strategic work. It will enhance your skills and allow you to take on new responsibilities. In fact, those who embrace AI and learn to work with it will have the opportunity to upgrade their positions within the company, leading to better compensation, benefits, and personal growth.

I understand that change can be daunting, but I assure you that we will support you every step of the way. We will provide training and resources to help you understand and adapt to AI technologies. Together, we will learn, grow, and build a stronger company.

I encourage each and every one of you to be open to this exciting new chapter. Remember, we are in this together. I am here to support you every step of the way. Let's embrace this transformation with an open mind, knowing that we have the opportunity to shape our future and create a workplace that is vibrant, dynamic, and rewarding.

Thank you for your hard work and commitment. Your contributions are invaluable, and I am excited to embark on this journey with all of you.

Thank you."

Oh, BTW... if you are reading this, you have read all of my eBook. I love you—and thank you too!

