

# opentext™

## **AI:**

## **Augmented Intelligence**

CEO White Paper

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## Introduction

Big data is here. Along with small data. And dark data. Structured data. Unstructured data. Machine data. Raw data. Recent data. Open data. Private data.

The data tsunami is unfathomably huge. And it is *exponential*.

As we entered 2020, humanity had accumulated around 44 zettabytes (44 trillion gigabytes) of data.<sup>1</sup> To put this into context: if we were able to digitize and store all human speech ever spoken since the beginning of time, it would still only be 42 zettabytes.<sup>2</sup> Our current 44 zettabytes amounts to 40 times more bytes in our digital universe than there are stars in the observable universe. *Ninety percent* of that data has been created in just the last two years.<sup>3</sup>

Every day, we are generating more information than we ever have before... and less than we ever will again.

In 2025—fewer than five years from now—the total amount of data in the world is forecasted to hit 175 zettabytes.<sup>4</sup> This is not only an unprecedented volume but a staggering speed, considering it took decades to create the first 44 zettabytes.

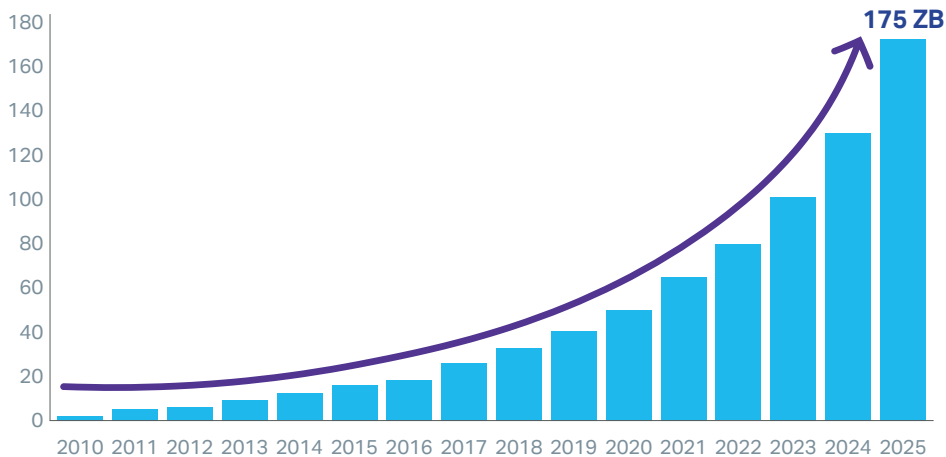


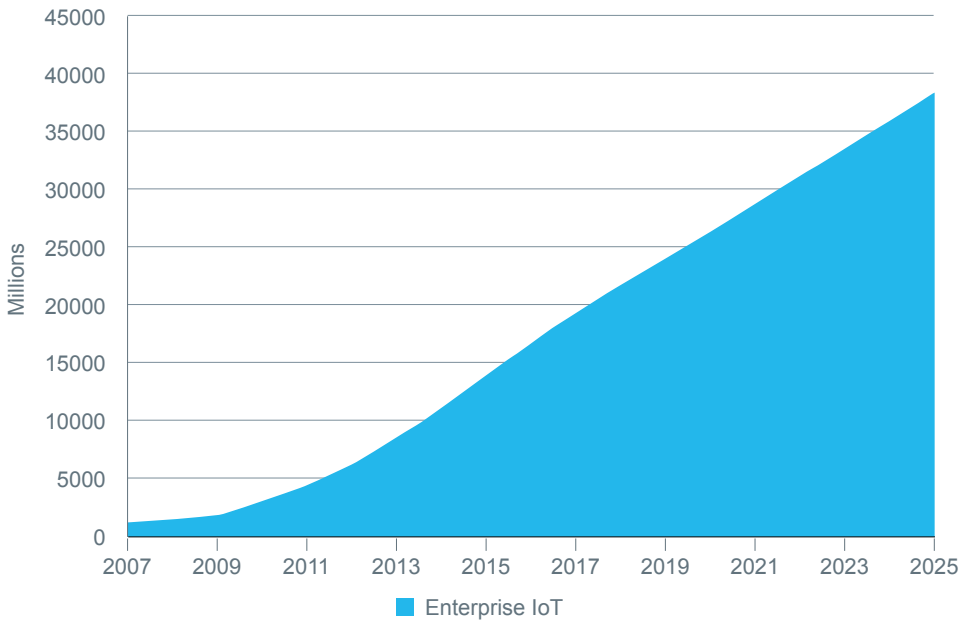
Figure 1:

Exponential Growth of Information<sup>5</sup>

Information volume, data transmission speed, computing power, technological advancement—it is all going exponential.

Industry 4.0 technologies, like artificial intelligence (AI), APIs, machine-to-machine (M2M) communication and the Internet of Things (IoT), are at the heart of this new information paradigm. They create vast amounts of data. Likewise, they are fueled by data.

Consider the IoT. Today's 22 billion devices will almost double, to 41.6 billion, by 2025.<sup>6,7</sup> Running on 5G networks, these devices—sensors, robots, autonomous vehicles, wearables, appliances, machinery and many others—will be able to transmit and receive information with accelerating density, speed and efficiency. Everyone and everything will be connected. Smart homes, factories and cities will seem to run effortlessly, while a torrent of information flows behind the scenes.



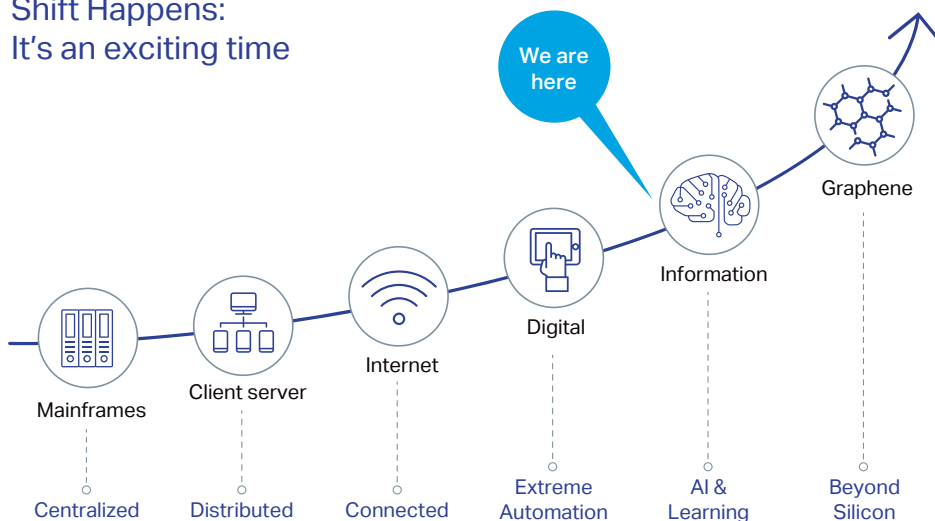
**Figure 2:**

IoT Will Change the World within Five Years

Information is rewriting all of the rules. It is powering new business models, new paths to understanding the world and new ways of being human. But the sheer volume of information is already far beyond human capacity to grasp, synthesize or make sense of.

This is the Information Age—and it has only just begun.

**Shift Happens:  
It's an exciting time**



**Figure 3:**

Technological Progress—  
The Information Age

## The Information Age

In the Information Age, information is the new capital.

It is driving widescale disruption and creating significant opportunities in every industry. Banking is disrupted by FinTech's convenience and simplicity. Retail is disrupted by ecommerce's frictionless customer journey and personalization algorithms (plus, new ways of shopping thanks to COVID-19). Traditional agriculture is disrupted by new insights in digital farming. Education is disrupted by customized e-learning platforms. The list goes on.

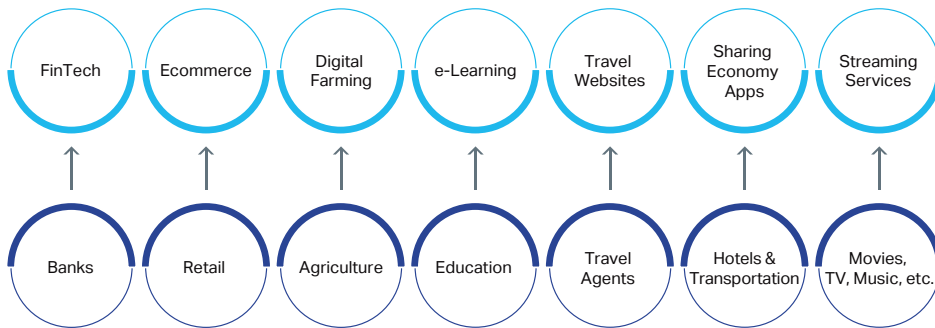
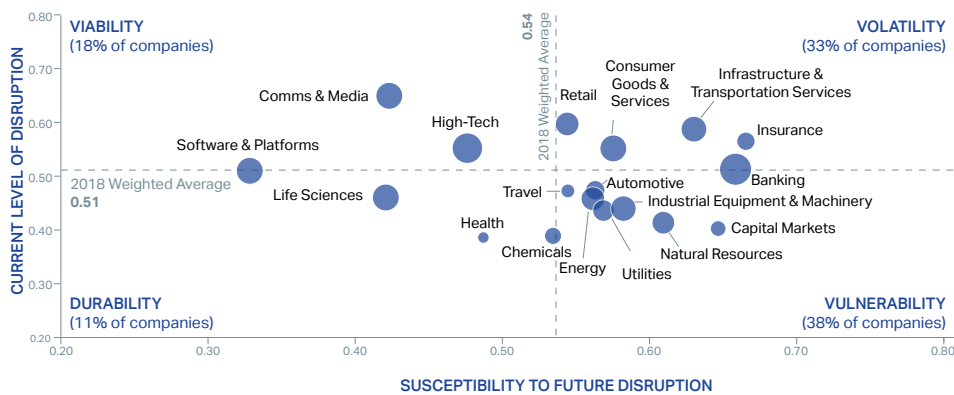


Figure 4:

Digital Disruption

Data is changing the world and the mantra is *get on board or get left behind*. Nearly every industry is either experiencing or vulnerable to digital disruption.

Disruptability Index Industry Sector Matrix - 2018 results  
0-1 scale (1 = most susceptible/disrupted)

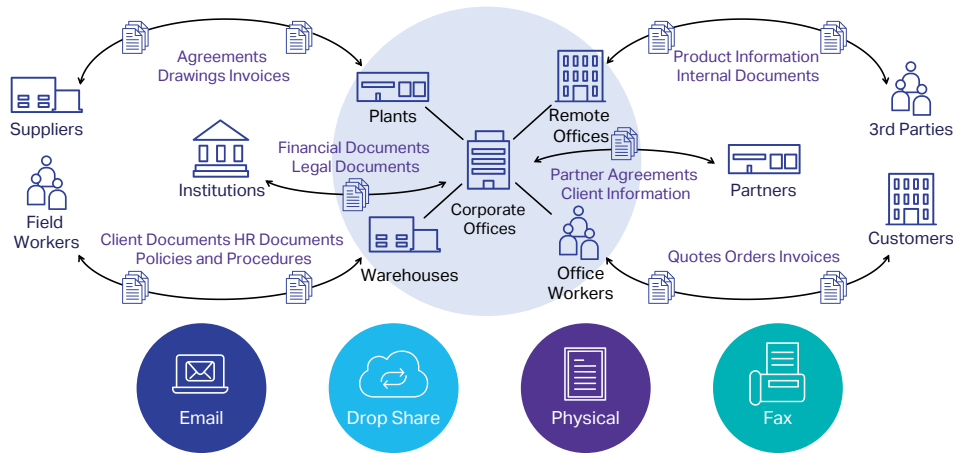


Source: Accenture Research Disruptability Index 2.0.

Figure 5:

Digital Disruption Index by Industry<sup>8</sup>

This new world requires a new mindset. Information is the lifeblood of every organization—or at least, those that plan to be around in five years. It flows from people, businesses, processes, applications and endpoints both inside and outside the organization. It comes in new volumes, new formats and from new sources. It encompasses everything from corporate records, to customer and partner data, to endpoint statistics, to intellectual property.



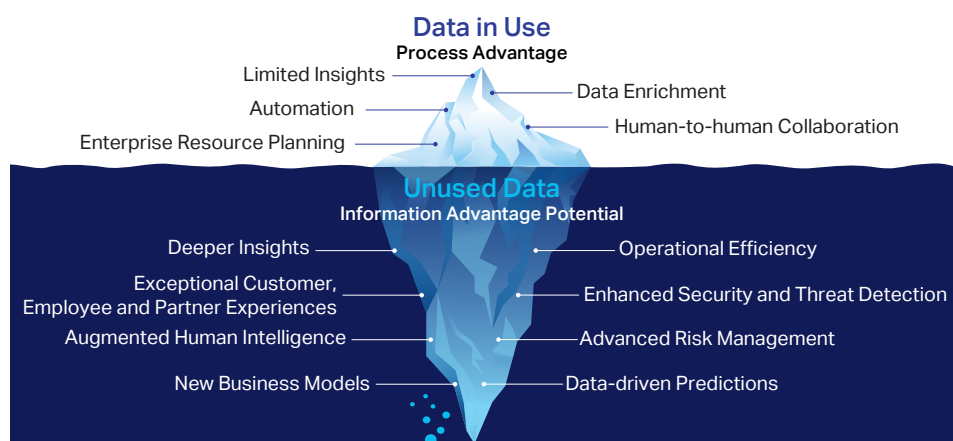
**Figure 6:**

Information Is the Organization's Lifeblood

Each company needs information-driven processes, people, technologies and business models—an end-to-end transformation. Information is not a by-product of doing business. It is critical to, and can often be, *the product, the service and the method of doing business.*

To achieve this transformation, however, companies must be able to engage with their data in meaningful ways. As the volume of information rises, so too does the pressure to do more with it. It is not enough to simply collect masses of data—it must be leveraged for success.

Most of the data that organizations generate—over 80%—is unstructured.<sup>9</sup> Conventional programs cannot read it. But neither can humans fathom it. Which is why anywhere from 55% to 99.5% goes unused.<sup>10 11</sup> And as our information sits in the dark, so do we. Employees do not have the information they need to do their jobs effectively. Automated systems are blind to a vast lake of valuable data. Leaders lack the insights to make better, data-driven decisions.



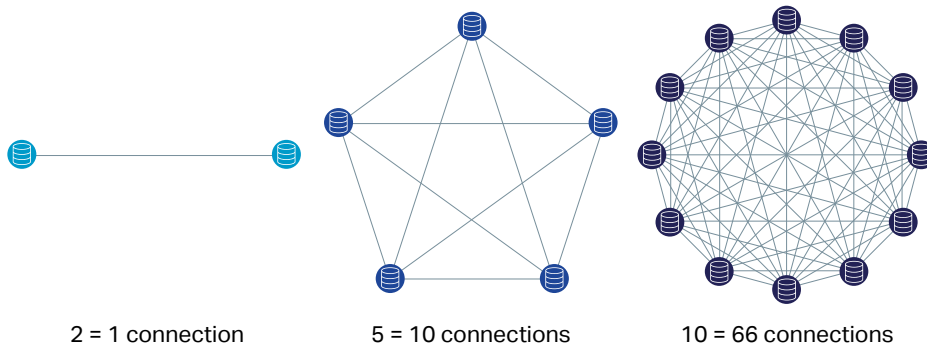
**Figure 7:**

The Untapped Potential of Information

This unused data is an enormous resource just waiting to be tapped. And once it is tapped, abundance overflows.

Information has a truly exceptional and powerful ability. It functions as a two-fold exponential feedback system: 1) *data begets data*, and 2) *the more data is used, the more valuable it becomes*. Each interaction produces more data, which is fed back into the cycle to produce even more sophisticated context and insights.

It boils down to this: more information means more possibilities, more connections and a greater advantage.



**Figure 8:**

Metcalfe's Law<sup>12</sup>—The Exponential Power of Data Abundance

Organizations *must* find ways to harness their information. Collect it. Manage it. Synthesize it. Analyze it. Get insights. Win. Repeat.

Humans cannot do this alone. It takes machines to generate this volume and complexity of data—and it will take machines to parse it.

Businesses need machine learning and artificial intelligence technology. AI can achieve information processing feats impossible for humans. It can formulate insights we could not have imagined. And, as we augment human intelligence with artificial intelligence, the horizons of what is possible expand every day.

## How AI Works

Not so long ago, the notion of machines thinking and acting on their own was the stuff of science fiction. Think HAL, C-3PO and the Terminator. And while AI is indeed defined as computer systems that are able to perform tasks requiring what we would typically think of as human intelligence, today's AI is a far cry from its depiction in the movies.

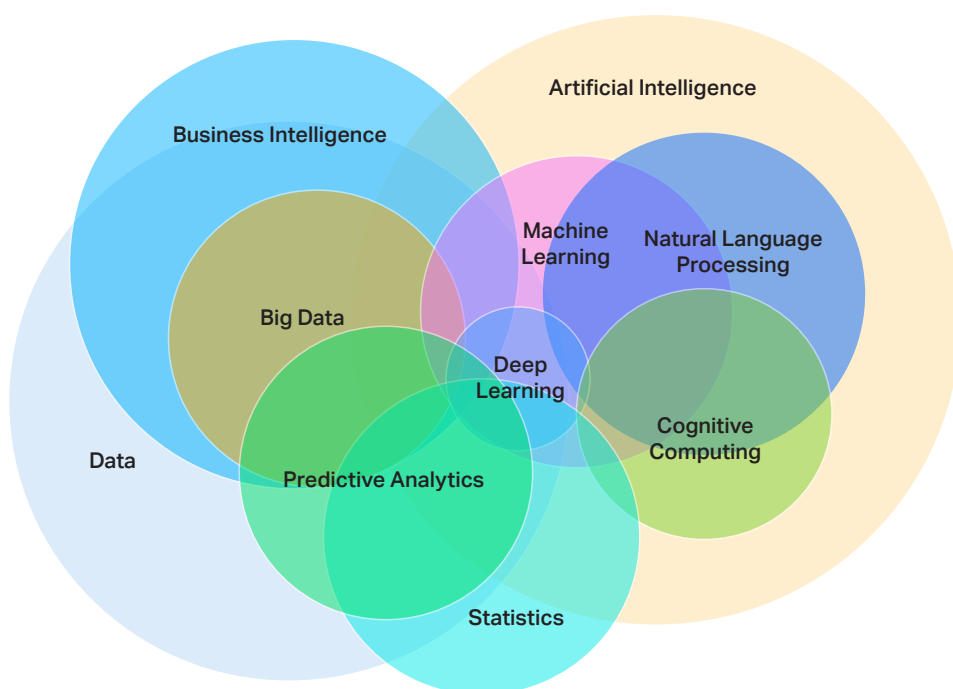
AI is not a single technology; it comprises several solutions that allow machines to manage information, automate tasks and predict the future. It works through machine learning, which uses complex algorithms to learn from data, without being explicitly programmed to do so, and to find patterns in large datasets. From those patterns, AI-powered solutions generate insights to enable machine-assisted decision making.

Most people already rely on AI, perhaps without even realizing it. It is in the app that figures out the best commute route, Netflix's suggestions on what to binge-watch next and the fraud detection systems protecting everyone's bank accounts. Eighty-five percent of Americans are using artificial intelligence, often interacting with it multiple times every day.<sup>13</sup> So much so, in fact, that many people communicate with AI more than with their own spouse!<sup>14</sup>

With so many powerful capabilities, it is no wonder that AI-driven solutions are becoming increasingly ubiquitous. It is the next big technology that will change the world, with a global market expected to be worth almost \$60 billion by 2025.<sup>15</sup>

Although interacting with AI may seem simple from the user's perspective, it involves many sophisticated technologies working together behind the scenes, each with powerful capabilities.

## Unpacking AI



**Figure 9:**

Artificial Intelligence



### Machine Learning

Machine learning is a branch of AI in which machines learn, without requiring explicit programming to do so, by processing data, including text and images. A machine learning algorithm acts as a series of instructions for decision making. Two of the major phases for machine learning are learning and prediction.

In the learning phase, the system processes historical data—typically in the form of structured data—and applies algorithms to identify trends. For instance, the system might be fed data on tigers with descriptors like “black and orange,” “stripes” and “feline.”

In the prediction phase, the system uses what it has learned to process new data. It finds patterns and trends in any novel data, matching them to those established in the historical data. For example, if the system encounters an image in an ad for a local zoo, it could classify the animal depicted as a tiger based on the stripes, orange and black color, and other pre-established characteristics.

This iterative learning process is refined over time as the system continues to ingest more information, making the AI more intelligent and adaptive.

Deep learning—sometimes also called “deep neural learning” or “neural network”—is a subset of machine learning that is modeled on the human brain. The system has many networks of algorithms stacked on several layers (and is, therefore, “deep”) that allow it to make sense of vast quantities of diverse, unstructured and complex data. It learns from experience and can acquire new skills without deliberate human guidance. Looking at our tiger example again, a deep learning system would not need to be told explicitly about features like “stripes” and “black and orange.” Through processing enough data, it would come up with its own markers to identify tigers from non-tigers.

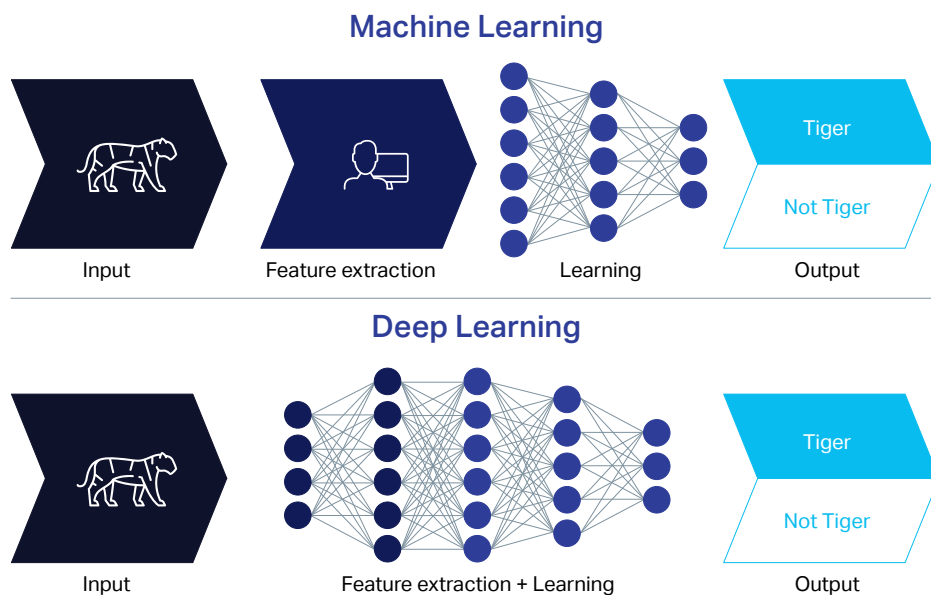


Figure 10:

Machine Learning versus Deep Learning<sup>16</sup>

### Predictive Modeling and Planning

With predictive modeling, machine learning models are trained using known results from historical datasets. They can then forecast outcomes and relationships likely to occur in future datasets and recommend specific actions. Predictive modeling is particularly useful for detecting areas of potential risk or reward. It can answer questions such as:

- How likely is it that an existing customer will purchase a specific product?
- How will a marketing campaign impact engagement or sales for a targeted customer group or region?
- Which claims are most likely to require additional review from fraud investigators?
- How likely is a patient to show up for a scheduled medical appointment?
- What components are likely to fail and when?
- Which customers are most likely to cancel their subscriptions?



OpenText wanted to find a solution to help retain customers and support the renewals process. We realized we had a great opportunity to: proactively identify contracts at risk of cancellation, allowing us to resolve issues earlier and reduce cancellations to record lows; prioritize work to maximize efficiency and strive for operational excellence; and, improve insights to continually serve our customers better.

To that end, the OpenText AI & Advanced Analytics team partnered with the Customer Support (CS) Enterprise Renewals team to determine how to best use our OpenText Magellan AI to uncover deep insights about customer contract renewals, with a goal of reaching record-high customer satisfaction levels.

The teams used Magellan Data Discovery to profile customer cancellations, apply a cancellation risk level from these profiles, and segment customers by risk level. Today, the renewals team has new Magellan BI & Reporting dashboards that show cancellation risk with a visual heat map, allowing for quick prioritization of their work and early intervention. Details of the risk are given, helping renewal representatives flag issues that they may not have seen.

This work, in combination with programs like Customer Support Outreach and allowing customers to opt-in to auto-renewing, allows the renewals team to focus on retention and drive on-time renewals, while maintaining a high level of data quality for forecasting and communicating next actions for at-risk renewals and reporting.

OpenText runs on OpenText.

### **Text Mining and Natural Language Processing**

Text mining makes sense of large volumes of unstructured, textual content, such as emails, documents and social media. Through natural language processing (NLP), text mining software extracts key metadata, identifies entities such as people, places, things and events, and can even provide summary or context for analysis. Beyond simply extracting this data, NLP can also conduct sentiment analysis to determine the author's tone (positive, negative or neutral), emotional analysis to understand the author's feelings (happy, sad, angry, etc.) and intention analysis to understand the meaning behind a message (to buy, to sell, etc.). Just a few use-cases for NLP include differentiating facts from opinions, understanding content so it can be automatically classified and understanding the voice of customers.

Text mining can also gather additional data to supply back into the system for deep learning.

### **Other Branches**

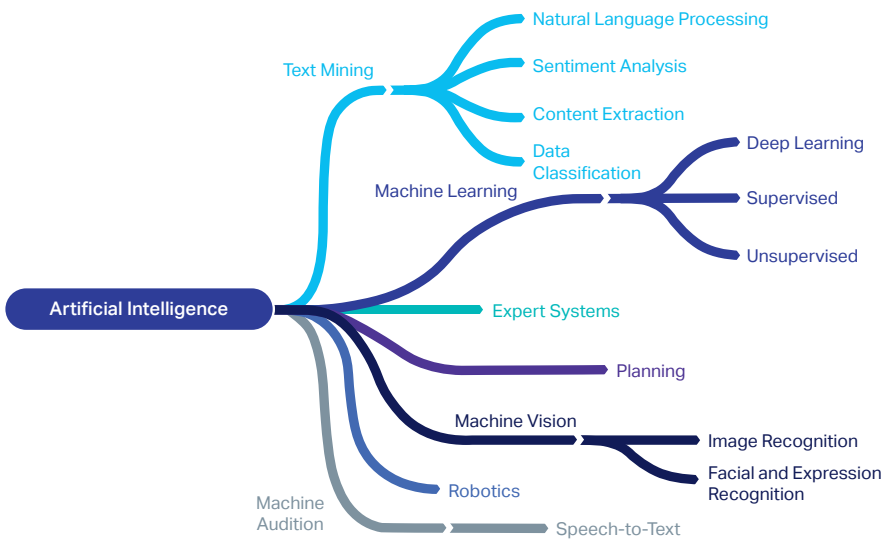
AI has many branches, all overlapping in intricate ways with each other as well as with other disciplines.

One such branch is expert systems: AI trained by human experts for complex problem solving, decision making and planning that emulates human ability in very specialized disciplines, such as healthcare or engineering. Expert systems are currently being used to help make medical diagnoses, troubleshoot equipment, schedule flights, plan manufacturing processes and much more.<sup>17</sup>

Meanwhile, other critical branches focus on perceiving, sensing and acting. This includes AI that is able to see (e.g. machine vision), hear (e.g. speech-to-text), and, intersecting with robotics, feel and manipulate the world around it.

**Figure 11:**

Key Branches of AI



### Augmenting Human Intelligence

Despite its remarkable capabilities, AI is not all-knowing—at least, not yet. For instance, although predictive modeling is a practical solution for anticipating buying trends, it still requires oversight from someone with market knowledge and experience. Human intervention on the front end must properly frame the problem for the AI and ensure that it uses high quality data sources. On the back end, humans must verify that AI solutions provide results that are free of ambiguity and bias. Of course, AI also lacks the empathy, common sense, intuition, ethics and natural curiosity humans have. Fortunately, AI and humans are perfectly suited to play to one another's strengths.

AI is only truly effective when humans work alongside it. It augments human intelligence by rapidly processing huge pools of data and extracting valuable insights—a task too tedious and time-consuming for any human. And, humans act as the gatekeepers of these insights by ensuring ample, diverse data is provided, monitoring for biases and looking for trends that could suggest predictive models are becoming stale. When implemented strategically, AI empowers people to become more informed and efficient while still maintaining a necessary human touch.

With this approach, humans learn from AI systems and vice versa, and both improve from the resulting partnership. This is the crux of the notion of AI-augmented intelligence.

## What Is AI-Augmented Intelligence?

AI-augmented intelligence is the act of enhancing human comprehension and knowledge through the use of AI capabilities, including machine learning and predictive modeling. It leverages algorithms to detect patterns in datasets invisible to even the most astute human statistician, solve the thorny problems that stump us and make better predictions about the future.

That said, AI-augmented intelligence does not aim to replace humans. Instead, it frees humans from the drudgery of manual, tedious tasks to allow us to spend more time innovating, strategizing and being creative. It then goes a step further, supporting these higher-level cognitive functions by breaking complex data down into accessible and valuable insights.

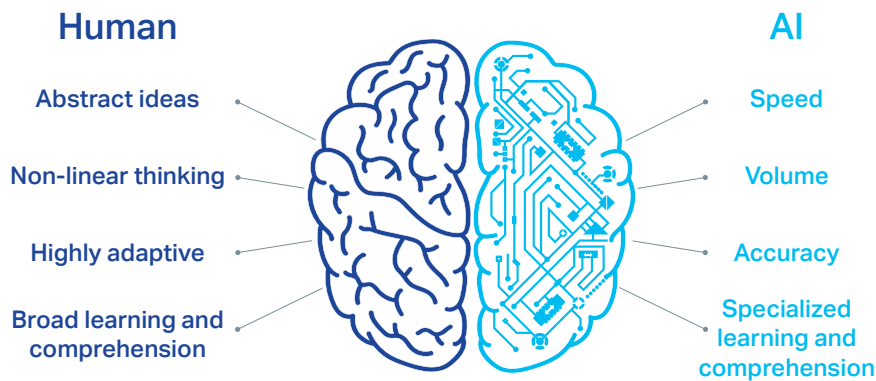


Figure 12:

Human Intelligence + Artificial Intelligence

With the wealth of data available to it today, AI has the ability to illuminate new relationships between elements of our world and reveal uncharted avenues of understanding.

### Why AI-Augmented Intelligence?

AI separates leaders from laggards. It helps us to make smarter decisions. To be bolder. To leverage the tsunami of information, understand more and get closer to the truth. To unleash the full magnitude of human intelligence.

Organizations are increasingly finding practical ways to implement AI to solve their greatest challenges and accelerate business. An estimated 37% of companies are already using it, with implementations growing an impressive 270% in recent years.<sup>18</sup> This trend is set to continue. Within a year, 80% of emerging technologies will have foundations in AI.<sup>19</sup> From optimizing the performance of high-value equipment in industries such as oil and gas to helping retailers better understand their customers' preferences, there are countless business applications for AI.

AI empowers organizations to extract every drop of value from their data. It effectively deconstructs big data, including both structured data and unstructured text or visual content, and transforms it into actionable information. This is especially important for today's businesses, contending with data-driven competitors who are using information to disrupt and dominate. Fear of disruption is *the* motivating factor for 75% of organizations to ramp up their big data and AI investments with greater urgency.<sup>20</sup>

Across sectors, AI is the key to success in the information age.

Artificial intelligence (AI) has the potential to create value across sectors.

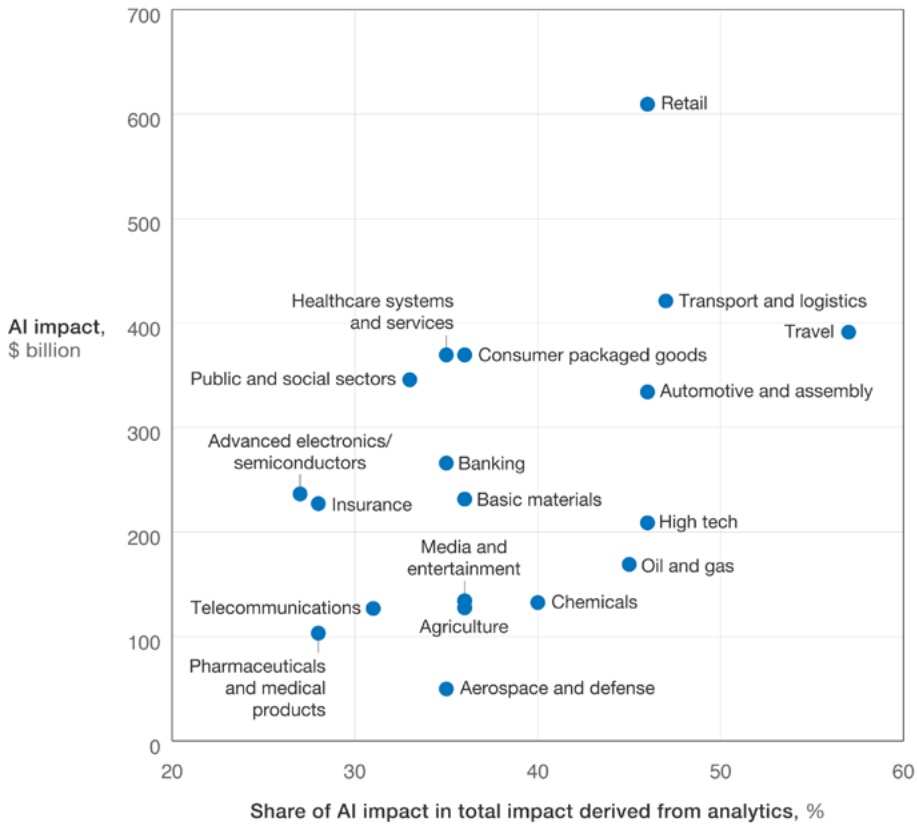


Figure 13:

AI Has a Vast Potential to Create Value<sup>21</sup>

### The Primary Advantages of AI-Augmented Intelligence

When deployed strategically, AI-augmented intelligence offers tremendous benefits.



Figure 14:

Top Benefits of AI

### Eliminates Need for Manual Data Processing

Processing numerical data is a challenge in itself, but unstructured content is notoriously unwieldy. Collecting all incoming information and getting it to the right place in a timely manner is a significant burden for companies as the quantity of data swells. Manual data tagging and sorting is laborious, costly and an impractical use of employees' time and effort. AI solutions provide one unified system for classifying, managing and extracting insights from data, eliminating the need to sift through multiple content systems and painstakingly process and route data.



## North Star BlueScope Steel

A wholly owned subsidiary of Australia-based BlueScope, North Star BlueScope Steel produces and supplies hot-rolled steel bands for coil processors, cold-rolled strip producers, pipe and tubers, equipment manufacturers and steel service centers. The company is the largest scrap steel recycler in Ohio, recycling nearly 1.5 million tons of scrap steel every year.

North Star BlueScope needed a new tool to assist in an area of business that was lagging due to outdated technology. At the time, costing was still being managed through Microsoft® Excel®, a time-consuming process that saw disparate areas of the enterprise manually collecting data in a file so large and inefficient that it could take up to 10 minutes just to open. North Star BlueScope needed a more efficient tool to help it more accurately understand its costing data and workflow, so the company could use it to engage with customers, conduct market-based analysis and build purchasing breakdowns.

The company decided to partner with OpenText for our Magellan BI & Reporting solution, a component of OpenText Magellan Analytics Suite, which they utilized as a business intelligence platform to visualize production and financial data through reports and dashboards. With an advanced approach to analytics, this tool is designed to automatically access, blend, explore and analyze data. It also allows the company to compare data month-to-month and analyze how events such as plant delays and bottlenecking might affect company profitability. This allowed North Star BlueScope to have a better understanding of customer trends and needs, for a more informed sales team.

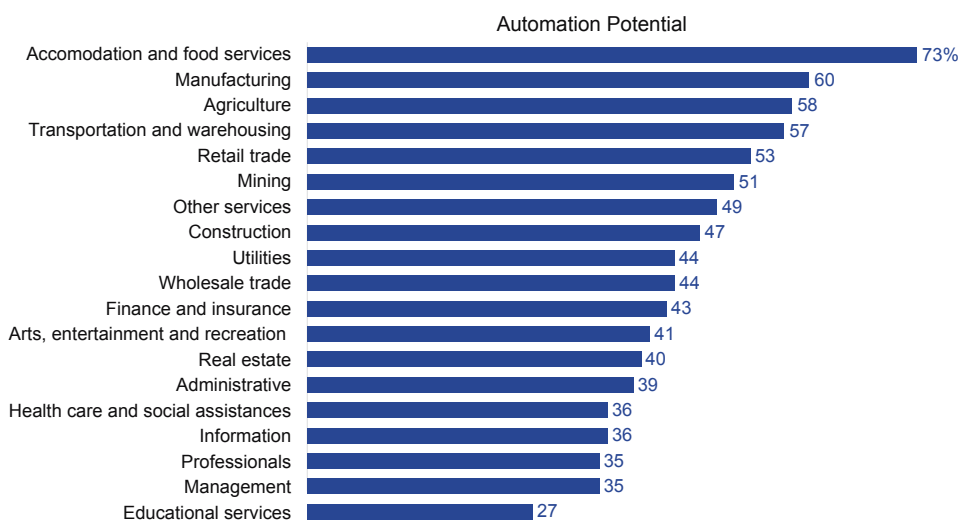
Building on its success, North Star BlueScope is also exploring the possibilities of using OpenText's Magellan Data Discovery tool to get better insight into their data. Potential uses include identifying customers who are likely to switch products and determining future needs to meet market challenges.

### Generates Shareable Insights

Most organizations struggle with internal information silos. Opportunities for cross-functional collaboration are thwarted without the ability to share valuable data-derived insights across the entire business. AI helps to connect the organization, catering to data scientists, knowledge workers and everyone in between to break down internal silos and curb information sprawl. When insights become easy to digest and share, multiple teams—both inside the organization and out—can collaborate on impactful, organization-wide initiatives that support the overall business strategy.

### Automates Processes

AI enhances human knowledge, but there are also many tasks it can automate entirely. Automation can replace nearly half of all activities in current jobs, with five percent being fully automatable.<sup>22</sup>



**Figure 15:**

Automation Will Replace Tasks in All Sectors<sup>23</sup>

Taking the human element out of these rote tasks eliminates the potential for human error (which grows higher as humans become fatigued with repetition) and enables companies to repurpose their workforce to higher order, more impactful activities.<sup>24</sup>

Collecting and processing data is only one type of task that AI is positioned to automate. It is also annexing retail checkouts, front-line customer support and repetitive manufacturing tasks. And as it becomes better at reasoning and decision making, AI is taking over fields like insurance claims, bookkeeping, investment portfolio management, basic HR and even legal research.





## Pillsbury Winthrop Shaw Pittman LLP

Pillsbury Winthrop Shaw Pittman (Pillsbury Law), who specializes in advising and counseling the world's largest companies across their litigation portfolios, is the first law firm to deploy OpenText Magellan, OpenText's AI-enabled analytics platform. Pillsbury will leverage Magellan to deliver expanded automation and artificial intelligence enhancements to the firm's global legal practice.

According to Pillsbury litigation partner, David L. Stanton, *"the Magellan AI suite gives us flexible machine learning capabilities and an adaptive suite of text-mining and visualization tools, which will change how we approach big data—driving faster and more in-depth legal analytics and permitting us to leverage custom data models and taxonomies to streamline labor-intensive tasks. We are building intelligent tools with Magellan to make our legal teams even more efficient and effective, with automated document summaries and chronologies, instant sentiment analysis and AI-enabled privilege detection already on the way. Our overriding goal at Pillsbury is exceptional client service, and this investment will help us deliver on that promise while keeping our clients' costs down."*

Magellan complements the firm's existing OpenText Accelerate Cloud deployment and will deliver extended machine learning abilities beyond traditional eDiscovery—enabling Pillsbury's attorneys to interact with large data collections in new ways that will make it easier to understand and present legal case narratives and to unearth investigatory facts. By leveraging AI for the heavy lifting, Pillsbury also enables their highly skilled attorneys to focus on the key documents that will shape legal strategy.

### Supports Compliance

Regulations, security and governance are all converging around data requirements to comply with information privacy laws like the General Data Protection Regulation (GDPR) in Europe, the Personal Information Protection and Electronic Documents Act (PIPEDA) in Canada, and the Health Insurance Portability and Accountability Act of 1996 (HIPAA), the Children's Online Privacy Protection Act of 1998 (COPPA) and California Consumer Protection Act (CCPA) in the U.S. To keep up with these regulatory pressures, businesses need adaptable and defensible governance practices in place. AI with NLP capabilities can automatically classify sensitive information and apply governance actions to it, minimizing the risk of non-compliance.

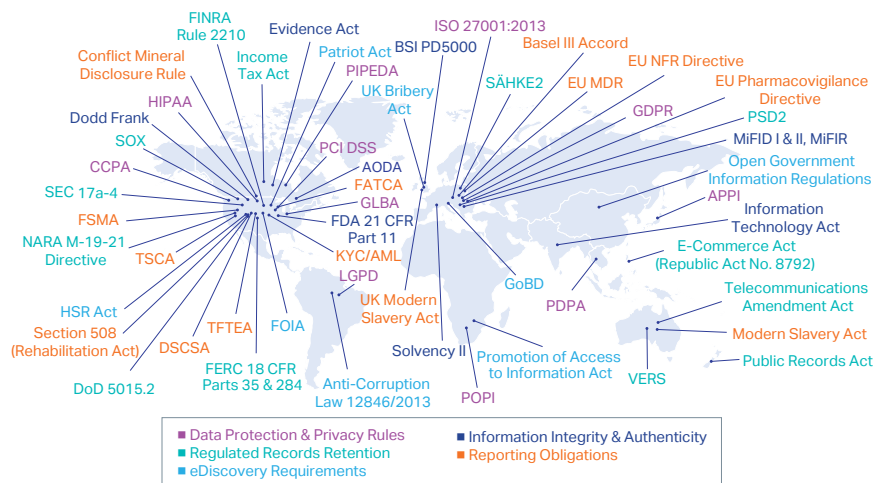


Figure 16:

A Snapshot of the Global Regulatory Environment

### Improves Security

The cost of cybercrime is crippling. A staggering \$2.9 million *per minute* to be exact.<sup>25</sup> Cybercriminals have the latest technologies—including AI—at their disposal. Machines are deployed against cyber-defenses, operating at a galactic scale, with volume, speed and agility humans can scarcely comprehend. They are perpetrating attacks that become business crises, like ransomware, denial of service, phishing and more. Consider that two percent of URLs are malicious, with a quarter of those hosted on trusted domains. In 2019, phishing sites grew by 640%.<sup>26</sup> And the most dangerous phishing sites only live for hours, or even minutes. Meanwhile, companies must protect swelling numbers of endpoints both inside and outside of the business network.

Organizations need to counter machines with machines to have any hope of stymieing today's advanced threats.

AI-powered security operations models are called AIOps, and they are tasked with analyzing big data from across the organization in real time, recognizing patterns, making predictions and automatically responding to deviations and threats. AIOps alone can accomplish the feat of monitoring a multi-layered, distributed network and all associated endpoints for threat activity; of reading the entire internet in real time and mapping the relationships between billions of IPs, URLs, files, and apps to spot suspicious behavior and predict future attacks; and of providing timely, accurate and predictive threat intelligence that can proactively protect against never-before-seen threats.

Businesses are taking note. Eighty-three percent of organizations in the U.S. believe that they will not be able to stop cyberattacks without AI.<sup>27</sup> As machine learning becomes more integrated in cybersecurity defenses, it will become smarter and smarter in identifying and responding to threats.

It is a machine versus machine world. Today's threats cannot be fought with yesterday's strategies.

### Increases Competitiveness and Performance

AI-augmented intelligence is a powerful means of solving some of the most complex challenges businesses face. It acts as a force multiplier, unlocking the hidden value of data, generating strategic insights and helping organizations capitalize on them with agility and precision.

In more than two-thirds of our use cases, artificial intelligence (AI) can improve performance beyond that provided by other analytics techniques.

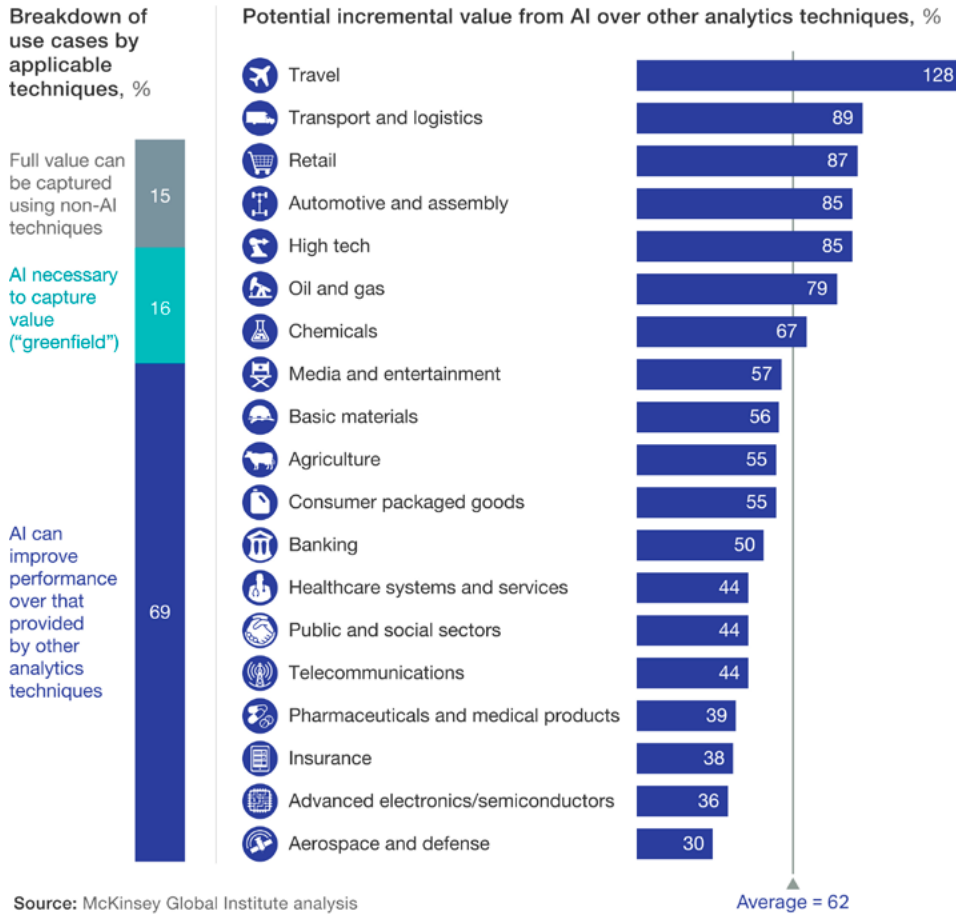


Figure 17:

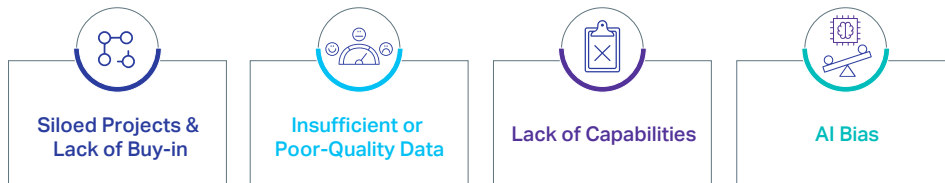
AI Boosts Performance Across Industries<sup>28</sup>

Most importantly, it can be integrated horizontally at every level where information is collected, managed and used—from marketing, to R&D, to customer support, to supply chain management, to manufacturing. A McKinsey report found that AI has the greatest potential impact when applied to top-line activities or bottom-line operational functions.<sup>29</sup> With so many potential applications, effective use of AI ultimately results in superior operational efficiency, exceptional customer experiences and rapid innovation.

However, before AI can live up to its immense potential, there are some challenges that must be overcome.

## Obstacles to AI-Augmented Intelligence

Despite organizations' eagerness to leverage AI-augmented intelligence, failed AI projects continue to run rampant. What is it, exactly, that prevents AI projects from getting off the ground?



**Figure 18:**

Top Obstacles to a Successful AI Implementation

### Siloed Projects and Lack of Buy-in

For AI projects to be successful, they must be accessible to all different user types throughout the organization. This includes knowledge workers and data scientists, as well as general operational business users.

Often, data science projects become siloed. AI implementations require cross-functional collaboration: line of business knowledge workers must define the problem to be solved and the data science team must frame it as a machine learning problem. Involved teams must then continually communicate to ensure the right data is used, the machine learning algorithms are effective for solving the problem, and the results are understandable and distributed throughout the organization. A simple way to ensure cooperation among those who will be using AI is to select a solution with user-friendly interfaces designed to accommodate each function.

Leaders must also embrace the use of AI and analytics for crucial decisions. Their buy-in can be achieved through clear communication and a compelling business case, including how action on AI-provided insights can increase revenue, lower costs or unlock new business models.

### Insufficient or Poor-Quality Data

Impactful AI projects must also start with the right quality and quantity of data. To draw meaningful insights and make predictions, machine learning models require clean data—free of extreme outliers, duplicates and NULL values. The common phrase in the industry is “garbage in, garbage out.”

The data must also be readily available. If there are security factors involved with sensitive data, what are they? Even if a connected data source is accessible now, will it be in the future? A data pipeline must be created to continuously feed the machine learning model. Ultimately, the owners of the data, business teams and data scientists must collaborate to verify the data is workable for machine learning projects.

**Figure 19:**  
Characteristics of Good Datasets



**Lack of Capabilities**

AI implementations are supported by a number of key capabilities, including data handling and engineering. While it is entirely possible to build the right team to create a mature AI framework, many organizations fall short in this area.

At the bare minimum, every effective AI project requires data scientists, subject matter experts, data analysts and a project manager. How those teams are distributed is just as important as sourcing the right talent. Some organizations embed their data science teams among various lines of business, while others exclusively maintain a centralized team of data scientists.

Most effective is a hybrid approach, with both a hub for data science and spokes distributed through various business units. The hub is generally responsible for overseeing AI talent, data governance and collaboration with software vendors. The spokes support activities surrounding implementation, including training, incentivizing use and monitoring results. This approach allows data scientists to play a key role in solving the pains of the business, while also ensuring AI is fully leveraged and best practices are followed across the whole organization.

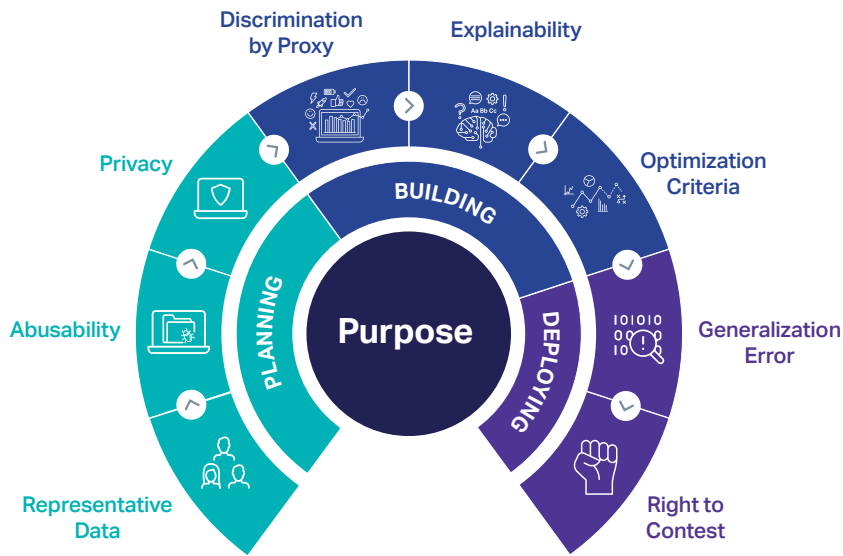
**AI Bias**

Although powered by machines, AI is not free of bias. Its learning is built on existing datasets. Since humans—who are inherently flawed—are the creators of data, it often contains historical biases. And, if a model is tainted by biases, it can have serious implications. For instance, if existing police records are used to train machine learning models, the AI would perpetuate past discriminations during future activities, such as targeting suspects.

Consider too how financial institutions might use AI to recommend who to lend mortgages to: the model may find that older individuals are more likely to default, and as a result may discriminate against them by requiring higher rates or recommend lending to them less often. This type of bias in AI would, in many places, be an illegal form of age discrimination that would also negatively impact the organization.<sup>30</sup> This is just one example of how futures can be influenced—if not entirely shaped—by AI.

While machine learning models must be built on historical data, some factors can be controlled to prevent bias. First, AI projects should be managed by a range of individuals with diverse perspectives. Second, machine learning models must be regularly audited for biases. If discovered, the models must be adjusted. Finally, organizations must establish a code of ethics for AI that is followed by all users.

Addressing AI biases is not a simple one-and-done activity. It is important to remember that it can arise at any point before, during or after the development of an AI model. That is why guarding against bias must become a key component of any AI framework, and be revisited at each stage of a project's lifecycle.



**Figure 20:**  
 Framework for Discovering and Guarding Against AI Bias<sup>31</sup>

Overcoming these roadblocks opens the path to a successful deployment of impactful AI-powered solutions.

## AI-Powered Solutions

It is clear that AI can help companies increase operational efficiency and productivity, make better decisions, decrease costs and enhance customer experiences. Its solutions can be applied to any industry and across different business units, making it among the most versatile and promising technologies positioned to radically change organizations across the globe.

Below are some of the most influential AI-powered solutions businesses are already leveraging.

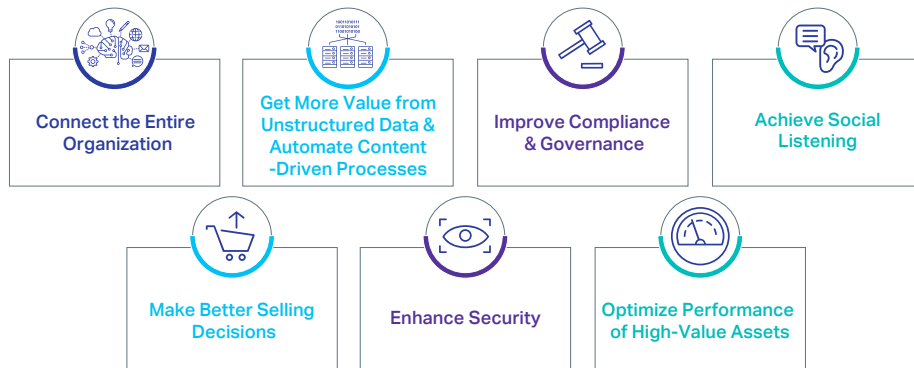


Figure 21:

Key Applications of AI

### Connect the Entire Organization

An organization has data scientists, subject matter experts and business users, all of whom excel in their roles but need to collaborate and connect across teams. AI-powered solutions create a system of insight across the organization, giving each user access to the learnings from artificial intelligence and enabling collaboration on value-add data science projects. With business intelligence reporting, data discovery tools, a data science notebook and text mining capabilities, AI and analytics platforms provide all contributors with the environment they are most comfortable working in.

Data scientists can publish and share machine learning models across the business within an AI data science notebook. Business users can explore this information through dashboards with business intelligence and reporting features that allow them to visualize insights, predictions and recommendations. Moreover, dashboards for operational users can be embedded anywhere; for example, in manufacturing facilities, operators can analyze both historical trends and real-time data from IoT sensors to prevent breakdowns and minimize downtime. Marketing users can use reporting features to review metrics from past campaigns as well as predictions for which actions will improve campaign performance moving forward. From a financial perspective, AI-powered systems simplify decisions for budget allocation and other key spending initiatives because they can process and analyze massive volumes of data that exceed the limits of traditional spreadsheet software, and provide recommendations.

### Get More Value from Unstructured Data and Automate Content-Driven Processes

Roughly 80% of enterprise data is unstructured: the messy, textual data which, unlike numerical data, is difficult to wrangle and use effectively.<sup>32</sup> Historically, organizations have not had the means to efficiently process this information. Seventy-one percent of enterprises say their unstructured data is growing faster than other business data—and making sense of these expanding data lakes is a pressing challenge.<sup>33</sup> That is why many companies are data rich, but insights poor.

Fortunately, advancements in AI and analytics have made it possible to overcome this by integrating NLP, text mining, context processing and AI-based analytics to accurately process raw text from the moment it is collected through to archiving and disposal. The system improves its accuracy over time as it ingests more data, providing increasingly useful findings on which predictive models can be built. Then, as new insights are generated, they can be distributed across visualizations and reports, allowing companies to truly operationalize the previously untapped findings within their textual data.

AI can then automate content assessment, guiding or taking action based on content-derived insights, improving productivity while mitigating risks.

One key application of this technology is AI-augmented capture. Adding to the foundation of intelligent capture, artificial intelligence enhances the ability to read and understand text within documents, generate insights that improve decision-making and automate processes based on those decisions. It digitizes and extracts all data within content, such as claims, emails, notes, spreadsheets, social media posts and web activity logs, then applies AI to understand and differentiate documents contextually and route them to the appropriate workflows or people based on context and priority.

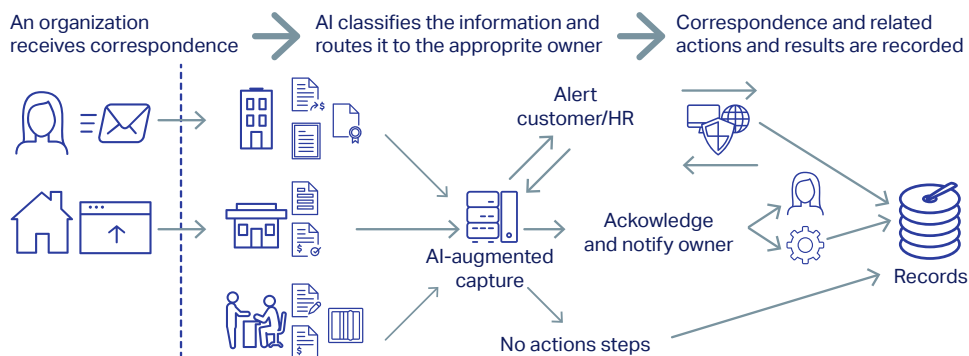


Figure 22:

AI-Augmented Capture

Consider an incoming document captured in the mailroom—is it an account application or a complaint about an order? If the latter, can the complaint response be automated, or does it require a human response? If it requires someone to respond, who is the best person to do so? If it requires manual handling, what process should be invoked and where should the correspondence and response be archived? Using natural language elements, such as sentiment, emotion and intention, along with institutional knowledge to understand the purpose of content and what steps to take regarding that content, AI can take care of the entire process. Humans only need to be involved at the last step to take the required action, if at all.

Organizations can also automate onboarding processes for employees, vendors and customers, thereby freeing up teams to work on other projects that demand human creativity and oversight.

Beyond capturing and routing information, AI can also be applied to categorizing, indexing and classifying it. It can understand meaning and put *content in context*.

When done manually, categorization is time-consuming, error prone and expensive. It costs about 63 cents per manually-processed document.<sup>34</sup> Put another way, manually finding and organizing incoming information in the public sector alone is costing around \$1 trillion annually.<sup>35</sup>



AI-driven solutions provide quick time-to-value by replacing the inefficiency of painstakingly accessing and classifying information with intelligent automation. Content in any format can be accurately categorized across applications and integrated into automated and scalable processes.

In automating routing and classification tasks that usually require human understanding, decision making and action, AI can significantly boost efficiency and shrink operational costs, ultimately accelerating business transformation.

### **Improve Compliance and Governance**

Using the same capabilities to understand the meaning of content in context and automate content-driven processes, AI helps reduce risk and proactively avoid regulatory fines or violations. With a high level of compliance and accuracy, it can automate processes such as audits, content migration, risk assessment, privacy and data governance. While important to all organizations, these processes are essential to healthcare, oil and gas, pharmaceuticals, financial services, government and other highly regulated industries.

Regulations like the GDPR now enforce strict requirements for collecting and managing personally identifiable information (PII). When companies do not realize they are storing sensitive information, cannot readily locate it or do not follow proper rules for handling it, they are at risk for non-compliance. AI can streamline governance by crawling large volumes of documents to identify this type of sensitive information and automating compliance actions.

Organizations also store vast amounts of data within their content repositories which could house countless images with potentially detrimental visuals, such as alcohol, drugs or violence. This imagery needs to be found, as it could conflict with organizational policies, compliance and government regulations. Through a combination of NLP and image analysis capabilities, these materials can be identified and remediated to mitigate organizational risk.

Machine learning and interactive visualizations can also offer compliance officers insight into risk levels and make recommendations to safeguard privacy.

### **Achieve Social Listening**

The customer experience is now more multifaceted than ever, with touchpoints across online and brick-and-mortar shopping, apps, emails and everything in between. The ability to stay competitive lies in providing the best experiences across these channels; companies must be able to learn what is working and what is not in order to improve.

Today's consumers are vocal with their feedback and expect their wants and needs to be heard. Positive or negative, feedback must be collected and used to inform organizational decisions. Yet, with so many platforms for voicing thoughts and opinions—Twitter, customer service chats, surveys, articles and emails, to name a few—getting a complete picture of how customers feel is difficult at best. Moreover, with so many roles involved in the customer experience, from store clerks at physical store locations to marketers trying to target the right audiences, managing the customer experience can become a fragmented initiative.

Organizations are turning to AI to help them listen. AI-driven Voice of the Customer (VoC) platforms tap into customer feedback from every source to determine sentiment, tone and emotion. They capture the entire customer journey in a single view, analyzing everything and identifying key engagement and decision drivers throughout the buying journey—informing organizations as they create better customer experiences and offer top products and services. AI tracks feedback across all channels, enabling fast collection and analysis, pinpointing key issues like shipment delays, product complaints and similar snags (as well as positive feedback) so companies can address problems promptly and show their customers that they have been heard. It can also help organizations monitor competitors' brands, as well as their own.

Ultimately, these powerful systems cultivate a deeper understanding of customers, helping promote loyalty and overall brand success. And, because visualizations, interactive dashboards and reports can easily be made available across the organization, cross-functional teams can collaborate on managing customer experiences and prevent their efforts from being siloed.

### Analyzing customer sentiment and providing an exceptional experience helps:

**Figure 23:**

Creating Exceptional Experiences<sup>36 37 38</sup>



These benefits are not exclusive to the private sector, either. Governments are using AI-augmented social listening platforms to hear the collective voice of their citizens and gain insight into the biggest issues facing them. The technology empowers government agencies to show their communities that they are listening by responding with appropriate policies or programs and making transparent decisions that align with their needs and wants.

For instance, a busy city might use an AI solution to gather feedback from locals and tourists. With text mining and sentiment analysis, leaders might discover that complaints like “no parking” are popping up on social channels. Based on this feedback, they could brainstorm ideas and deploy solutions such as a city-wide transportation app to help drivers find open parking spaces using their smartphones.

A photograph of the Parliament Hill building in Ottawa, Canada, featuring its iconic Gothic Revival architecture with multiple spires and a central clock tower. The building is set against a clear sky with some light clouds. The text 'Government of Canada' is overlaid in white on the left side of the image.

## Government of Canada

Canada joined government leaders and civil society advocates from around the world to create the Open Government Partnership in 2011. The goal of this partnership is for governments to become more transparent, accountable, and responsive to their citizens, thus improving the quality of governance, as well as the quality of services that citizens receive.

Building trust, transparency, and responsiveness requires governments to listen to their citizens and appreciate their priorities. With recent advances in social, mobile, and artificial intelligence (AI) technologies, governments and other organizations can listen more closely in order to understand the concerns and urgency of the public voice. During a recent Open Government Partnership Summit with 2,500 attendees from more than 100 countries, a sentiment tracking and analysis tool from OpenText was used to gain insight into attendees' thoughts, concerns, and priorities.

OpenText Magellan's AI-powered Voice of the Customer leverages AI to provide a comprehensive view of public sentiment. It combines open-source machine learning with advanced analytics, enterprise-grade BI, and the ability to acquire, merge, manage, and analyze structured data and unstructured data in a wide range of formats. The solution is a powerful tool that quickly unlocks and interprets the valuable content that can be found in data sources such as social media feeds.

With powerful machine learning and text analytics, the Magellan solution swiftly sorts through, classifies, and makes sense of tweets, comments, emails, or documents. The text mining tool processes raw text, extracting mentions of people, places, events, or concepts and then evaluates them for tone and sentiment. At the Open Government Summit, the tool was used to track attendee sentiment and analyze it according to elements such as source country. Then, the solution's reporting module can render the findings as colorful, interactive charts and visualizations. With just a few clicks, the parameters can be changed to analyze coverage by numbers, tone, theme, or other elements to reveal unique insights.

The ability to monitor and process thousands of tweets and analyze the discourse around the Summit's topics helped the Open Government team gain insight that furthers the Partnership's common goal of honest dialogue and collaboration between governments and citizens.

## Make Better Selling Decisions

Today's fast-paced business landscape demands agility. Companies must optimize the customer experience, providing personalized interactions that stand out among generic offers.

AI-enhanced recommendations harness customer preference and sales data, and routinely monitor activity to predict decision points and impactful actions, such as targeted offers and cross- or upsell opportunities. In doing so, AI enables organizations in retail, finance and similar consumer-facing industries to deliver highly personalized experiences to enhance the customer journey, engagement and retention. By leveraging big data analytics and sentiment analysis, AI can predict with increasing accuracy whether customers will purchase a particular product or service, and then serve up recommendations aligned with those preferences. Continuously catering to preferences encourages customers to remain loyal for longer. For example, using a "you might also like" strategy at each purchase interaction can, over time, boost revenue 10-50%.<sup>39</sup>

Retailers in particular are leveraging AI recommendation engines to determine consumers' buying propensity or level of readiness to make a specific purchase based on data like previous purchase history and online habits. Armed with these predictions, retailers can trigger the most relevant offers for the right customers at the right times, instead of annoying them with repetitive, generic offers.

By capturing each offer (or email, text, sale, etc..) that an individual customer responds to, as well as those they ignore, AI can increase its understanding of customer preferences and its ability to predict the best experience. With deeper understanding comes the ability to adjust pricing to maximize sales or margin; indicate the best time to contact a customer; determine when to hand off leads to sales for maximum efficiency; or reduce customer churn by offering specials to customers at risk of defecting.

## Enhance Security

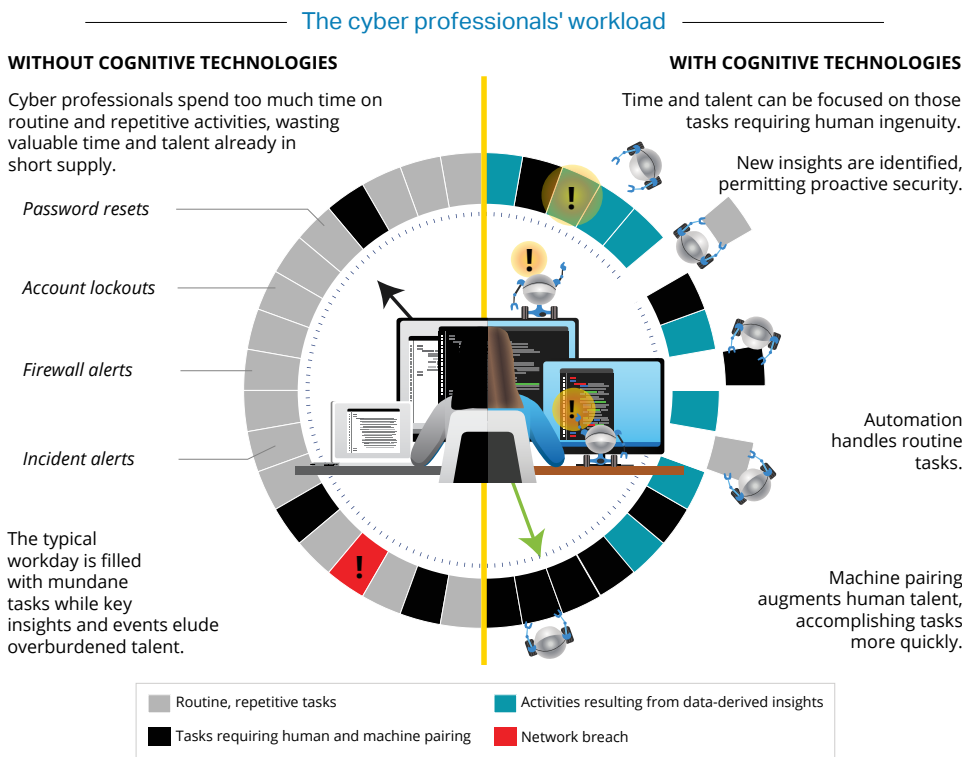
Data is the new form of capital, and cybercriminals will go to great lengths to get it. As of 2019, the cost of ransomware attacks alone was \$11.5 billion for businesses and nonprofits, predicted to reach \$20 billion by 2021.<sup>40</sup> These and other types of data breaches have serious consequences for organizations, including identity theft, theft of actual assets, disruption to business, regulatory risk, reputational damage and revenue loss.

Any security solution that requires human intervention is simply inadequate for responding to the speed and sophistication of today's cyberattacks. Coupled with the growing volume of big data, human-dependent solutions cannot keep networks protected. Moreover, highly skilled hackers know how to trigger attacks that bypass traditional "castle and moat" cybersecurity systems, leaving security teams unaware of the breach.

Enter AI-enhanced security. AIOps automatically detects and responds to evolving threats. These technologies gather all security data, structured and unstructured, and enrich it with network metadata to gain visibility into all network activities. This enables advanced and flexible detection-and-response models that can discover and quickly adapt to cyberattacks. These systems safeguard organizations against major data security breaches while also supporting compliance with data privacy laws, including GDPR and CCPA.

AI-enhanced security also supports fraud detection by identifying trends and patterns in behavior. Predictive analytics can monitor all activity in real time to spot deviations indicative of fraud, vulnerabilities or threats. Once these anomalies are found, the system can automate preventive action—a particularly important function in the financial services industry. Today, fraud detection is expanding as cybersecurity becomes a major concern.

Finally, AIOps achieves endpoint detection and response. Traditional approaches to securing endpoints based on the hardware characteristics of a given device are no match for today’s breach attempts. Attackers are combining AI, machine learning and new social engineering techniques to thwart endpoint security controls and gain access to business systems. AI-augmented security can combine data such as previous behavioral patterns, time of login and many other variables to assign risk scores that are effective at securing and controlling endpoints.



**Figure 24:**  
AI-Augmented Cybersecurity<sup>41</sup>

Source: Deloitte analysis.

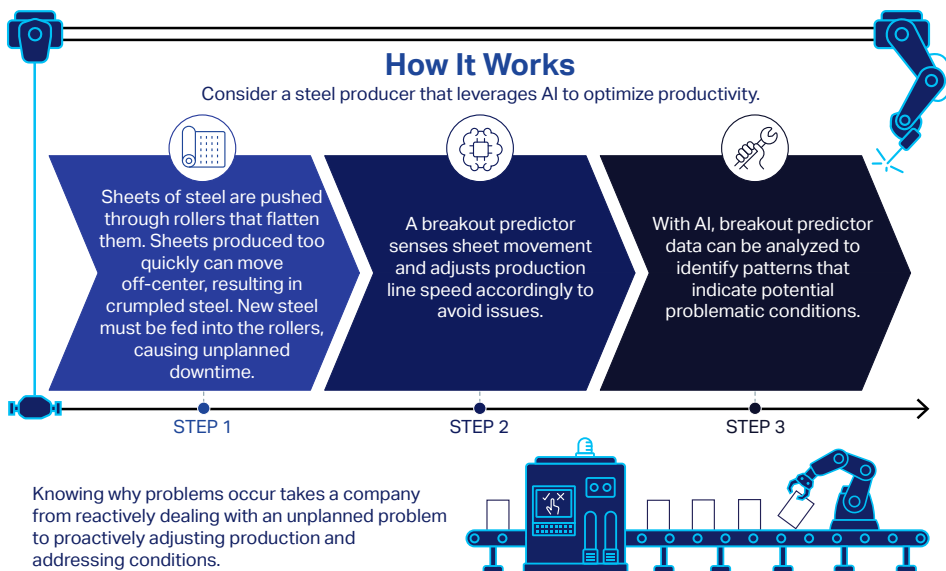
### Optimize Performance of High-Value Assets

Business leaders responsible for asset performance depend on data to make decisions about maintenance schedules, parts procurement and retirement of industrial assets. Asset optimization is especially critical in industries relying on high-value machinery, such as oil and gas, manufacturing or transportation. When assets need to be repaired or replaced, downtime costs \$1.3 million per hour, on average.<sup>42</sup>

AI, combined with the IoT, is being used to acquire, merge, manage and analyze big data and big content, including data from sensors, information management systems and external sources, to extend asset lifecycles by 20-40% and maximize equipment uptime to improve productivity by up to 20%.<sup>43</sup>

**Figure 25:**

How It Works: Steel Producer



Harnessing AI, organizations have access to predictive insights derived from a holistic knowledge base, with the ability to improve those insights over time as assets are used, maintained or taken out of service. As more data is collected, the AI could predict when a part is likely to fail based on factors such as use, external conditions, maintenance history and past performance. The system would automatically flag the part for maintenance, so the failure never occurs, reducing downtime, avoiding safety issues and potentially even mitigating unexpected environmental impacts. Becoming predictive is how companies will reduce risk and optimize their assets.

AI-optimized predictive maintenance schedules empower businesses to intelligently forecast repairs in order to:

- Proactively address problems to ensure smoother operations
- Increase uptime for more opportunity to generate revenue
- Detect issues before failure to lower costs and improve safety
- Improve customer satisfaction by reducing quality defects and delays
- Save money and labor while reducing downtime
- Reduce capital investment due to longer asset lifetime value



## Knorr-Bremse Group

The Knorr-Bremse Group is the world's top manufacturer of braking systems for rail and commercial vehicles, such as freight trucks and metro lines. The company continues its technical innovation and leads the way in Industry 4.0 and Internet of Things (IoT) solutions to address digital transformation.

Knorr-Bremse has developed its iCOM (Intelligence Conditioned Oriented Maintenance) platform, providing advanced diagnosis and maintenance for both large and small rail and truck fleet operators. iCOM is an IoT application framework for innovative fleet management, monitoring and analytics. iCOM uses the data to enable condition-based, rather than static, scheduled maintenance for Knorr-Bremse. This means customers of iCOM can identify any issue before it becomes a serious safety problem or needs a more costly repair or replacement.

Knorr-Bremse selected OpenText™ Magellan™ BI & Reporting due to its superior built-in graphical design studio, dashboard capabilities, speed of development and usability. It was also a natural choice for building on Knorr-Bremse's knowledge, developed using Java and BIRT.

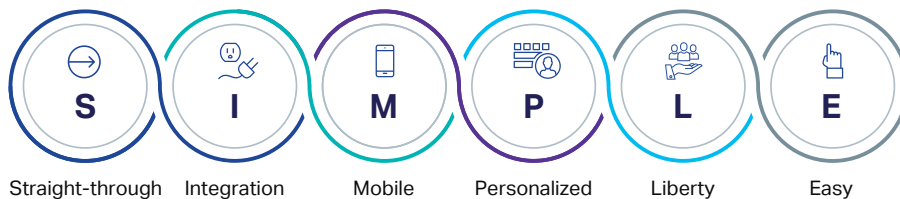
Customer reaction to the analytics and reporting available within iCOM has been extremely positive. With standard widgets delivered as part of their dashboard, users can quickly make adjustments to display what they need, such as performance indicators, component failure rates, environmental conditions and more, with no need to involve IT. In addition, customers can decide what they wish to record across various IoT subsystems and can build their own reports and dashboards as needed. An event message is recorded when a specific condition is met, such as excessive temperature. iCOM continually records process data, providing the ability to view subsystem performance over time.

AI-powered asset performance optimization helps asset managers identify key data points and recommends actions based on the complete picture of the asset, drawing on its environment and data related to its past, present and future.

## AI Is the Future

The future of AI holds enormous promise. This technology, with its ability to skyrocket our capabilities, will be the defining factor that separates top performing organizations from those doomed to fizzle out. As AI implementations increase in size and scope, forward-thinking companies will consistently leverage it to solve their greatest challenges. It is no surprise that 93% of executives expect AI to bring value to their enterprise.<sup>44</sup>

Indeed, we are only seeing the beginning of the ways AI will deliver value to organizations. AI-driven automation will continue to accelerate. For example, more chatbots will power customer service interactions and other customer-facing functions, with 80% of businesses using chatbots by the end of 2020, and that number will only go up.<sup>45</sup> These next-gen chatbots will integrate with data analytics to predict customer behavior, and adapt tone and vocabulary to provide a personalized experience for each customer.<sup>46</sup> Advanced AI will give chatbots new capacity to recognize mood, emotion and intent, and respond with apparent awareness and empathy to customers' needs. Employees, too, will spend more time with chatbots—by 2023, 25% of employee interactions with applications will happen via voice, up from less than three percent in 2019.<sup>47</sup>



**Figure 26:**

AI-Driven Chatbots  
of the Future: SIMPLE<sup>48</sup>

Businesses will increasingly leverage AI for categorizing, classifying and routing ever-growing sets of data and content, especially untapped unstructured data. Armed with information from every source, AI will automatically assess mountains of data faster than any team of humans ever could and enable businesses to gain insight and make strategic decisions—fast. Human and machine teams will be inseparable, functioning as one unit that combines EQ and IQ to help organizations thrive.

As AI eliminates many mundane, repetitive aspects of business, job losses are inevitable. Large-scale disruption is at hand. But most evidence suggests that AI will ultimately spur job creation and growth. It is estimated that AI will create more jobs—around 2.3 million—with many new opportunities predicted to open up in education, the public sector and healthcare.<sup>49</sup> Many of these new occupations will be unimaginable to us today, as flying an airplane was unimaginable to the farmers of the 1800s. Demand will rise for roles like big data scientists, machine-human teaming managers, technology interpreters, quantum machine learning analysts... the list goes on, and these are just the jobs we can foresee based on the technology available today.

Even jobs that do not completely disappear will be “shredded,” meaning automation, robots and AI will take over the mundane aspects of the job, leaving the higher-level activities to humans. Everyone, from writers to warehouse workers to CEOs, will need to learn to work productively with “cobots” that will do anywhere from 30% to 70% of their previous tasks. By automating routine tasks while simultaneously providing a clear line of sight into the factors that profoundly influence business, AI will create unprecedented opportunities to channel creativity and innovation.





Figure 27:

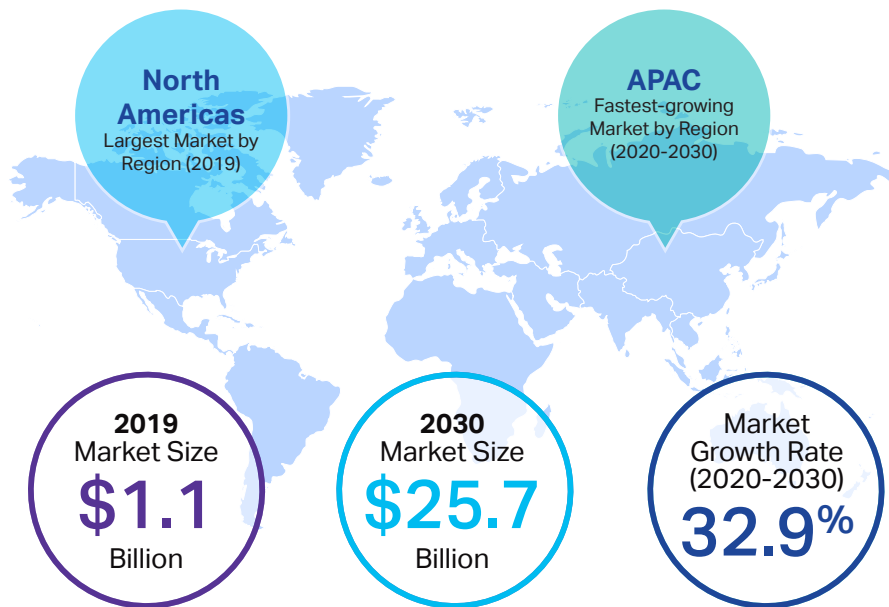
AI and Automation Will Free Up Human Time

In fact, AI-driven applications may one day commonly function as co-authors for creative works and services. The next generation of creators are growing up playing with artificial intelligence—in gaming, on social media and on smartphones—and these will inspire their creative endeavors as adults. Experiments have already begun that use AI to create works of fiction, demonstrating that algorithms have a startling ability to generate content and understand such difficult-to-code concepts as “plot twist.”<sup>50</sup> In the future, such AI tools for content co-generation may be the norm. They will even contribute ideas for new products. Experimenters recently developed an algorithm to generate novel scents for candle products.<sup>51</sup> Admittedly, some of the scents it created are better than others (“Coastal Waters Glow” vs. “Lemon Lime Decay” and “Baggy Air”), but R&D teams of the future will rely heavily on more sophisticated versions of AI.

AI in education is also expected to grow by more than 45% from 2017 to 2025.<sup>52</sup> Companies are designing smart education platforms that will individualize learning for each student. AI tutoring applications are already available for disciplines from mathematics to foreign languages.<sup>53</sup> Such developments are essential now, as schools face long periods of distance learning and potentially permanent shifts due to the COVID-19 pandemic. Under lockdown conditions, AI can help create individual learning plans for elementary and secondary students, and even provide feedback on assignments, freeing up teachers to focus on the students and topics that are most in need of their time.<sup>54</sup> Post-secondary institutions are experimenting with AI to respond to students’ questions in real time and remind them of key deadlines.<sup>55</sup>

Figure 28:

Global AI in Education Market<sup>56</sup>



As organizations continue to use AI to their advantage, it will stop seeming like a futuristic sci-fi concept and become a powerful practical tool for transforming how we learn, work, live and play.

However, before these exceptional changes can occur, businesses must first execute meaningful AI projects that work for them—whether it is personalizing the customer experience, overcoming parking challenges in urban environments or helping save lives in the healthcare sector. This will require identifying use-cases, building a business case, creating cross-functional teams and managing digital platforms to collaborate. Thanks to the increasing availability of user-friendly AI systems, business users from across the enterprise will have access to projects powered by machine learning models. To ensure non-data scientists understand and use these solutions effectively, more and more organizations will launch enterprise-wide training initiatives. In fact, Gartner predicts that 80% of companies are already deploying some type of data literacy training to help the members of their organization extract the most possible value from their data.<sup>57</sup> And, when all teams have the ability to learn from and collaborate around the insights that data yields, intelligence becomes truly augmented.

According to the Flynn Effect, IQ scores increase three points every decade—at least, that has been the trend since 1930.<sup>58</sup> At this rate, average human intelligence could parallel that of great minds like Stephen Hawkins or Albert Einstein in just 200 years. Yet, AI-augmented intelligence has never been factored into the equation. With the ability to rapidly process and draw insights from vast stores of knowledge, our intelligence will only accelerate—likely at a dramatic pace. Especially with the very real possibility of implanting AI capabilities directly into the human brain through new brain-machine interfaces, such as Elon Musk’s Neuralink (still in its early stages today).<sup>59</sup> Achieving a symbiosis with AI, we may see a day when the highest IQs fall not in the upper 100s, but actually exceed 1,000. With that level of intelligence will come the ability to solve some of the greatest challenges not only in business, but across the globe.

## AI for the Good

AI, neural networks and machine learning have tremendous potential to help us solve the world’s greatest challenges. Challenges like eliminating systemic discrimination. Reaching zero poverty. Solving the climate crisis. Curing disease. Anticipating and reacting to future global disruptions.

It will not be easy; AI is not inherently good, nor is it inherently bad. It is a tool, which must be combined with our capacity for compassion, justice and ethical behavior—our humanity, in a nutshell. AI will help herald in a new era of prosperity if—and only *if*—we prioritize the social impact of technology instead of considering it as an afterthought.

Before we can do this, we must address, again, the elephant in the room: biased AI. Learning algorithms do not care about morality or preventing discrimination. In the single-minded pursuit of their tasks, they align themselves with the ideological, racial and gender biases of their creators and society at large. There are, quite frankly, too many examples of AI bias in current use-cases. Sexist AI that discriminates against female job applicants.<sup>60</sup> Racist AI that disproportionately targets people of color for predictive policing and severe sentences within judicial systems.<sup>61 62</sup> Homophobic AI that labels homosexuality as “negative sentiment.”<sup>63</sup>

Bias in AI entrenches and magnifies existing injustice. This is why any discussion of using AI for the good *must* start with eliminating AI bias and building responsible, accountable and transparent algorithms.

### Minimizing bias will be critical if artificial intelligence is to reach its potential and increase people’s trust in the systems.

Six potential ways forward for artificial-intelligence (AI) practitioners and business and policy leaders to consider



Source: McKinsey & Company

It will take deliberate human intervention to unshackle machine learning from bias. Thankfully, both governments and organizations are mobilizing for algorithmic responsibility. Around the world, pioneering legislation is being introduced, including the EU’s GDPR and an “Algorithmic Accountability Act” bill proposed in the U.S. last year.<sup>65 66</sup> Simultaneously, businesses are taking action. With over 100 partners in 13 countries, The Partnership on AI (PAI) is committed to developing best practices for creating safe, inclusive AI, as well as engaging relevant stakeholders in the conversation. One of PAI’s central goals is to “identify and foster aspirational efforts in AI for socially benevolent applications.”<sup>67</sup> Furthermore, tech giants, including Microsoft and Google, have dedicated entire divisions to using AI for the good—divisions whose goals include finding ways to root out and correct algorithmic bias.<sup>68 69</sup>

Figure 29:

Six Ways to Minimize AI Bias<sup>64</sup>

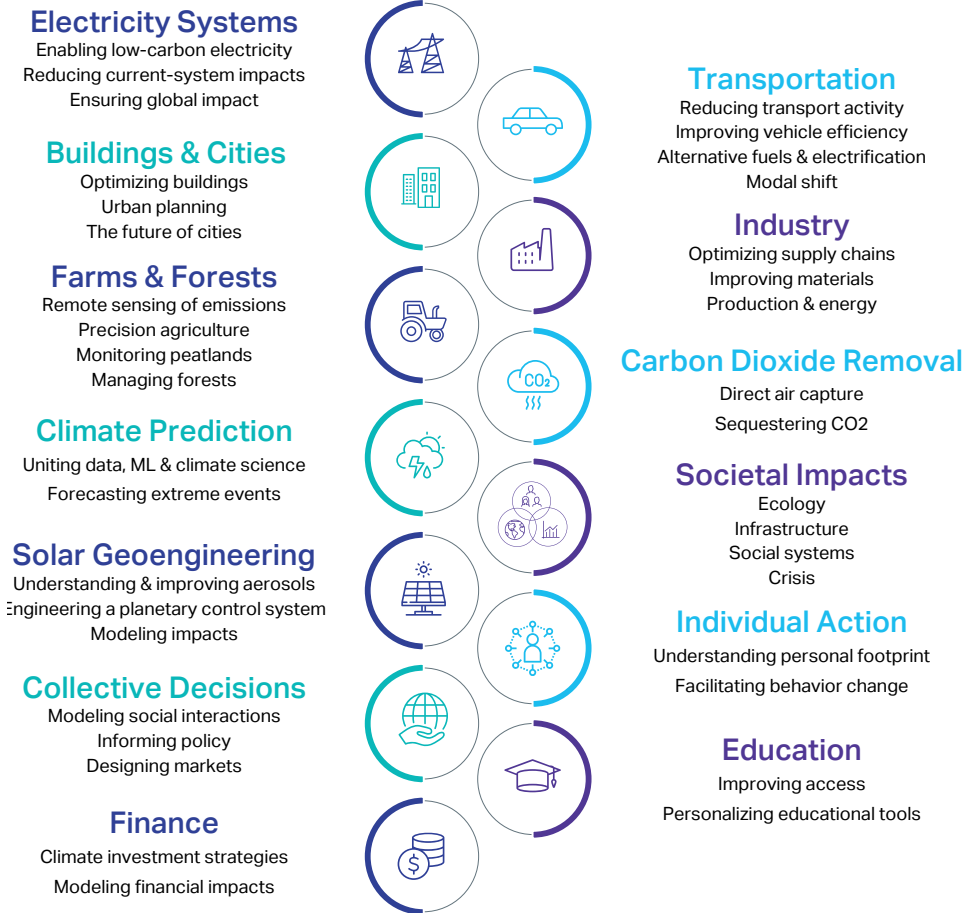
Unbiased AI tools will open powerful opportunities for equity. For example, traditional hiring (humans looking at resumes) results in women and minorities being at a 50-67% disadvantage.<sup>70</sup> AI could be trained to *prefer* diversity. The first year Unilever used a hiring algorithm that was regularly audited for bias, it hired its “most diverse class to date.” This included gender parity and a dramatic increase in people of color among new hires.<sup>71</sup> Likewise, Holberton School’s automated admission system for its esteemed software engineering program admitted 40% women in the typically male-dominated field. As with Unilever, the software significantly increased the number of women and visible minorities.<sup>72</sup>

When used for the social good, AI has the potential to help us become better versions of ourselves and enable marginalized groups to access better educational, vocational and economic opportunities.

AI is already being used to empower people living with disabilities. As the technology gets better at seeing, hearing and understanding, it is able to help people with disabilities gain more independence and opportunities in their day-to-day lives. Consider the app that describes what it is seeing to someone with a vision impairment, turning “the visual world into an audible experience” so they can engage more with their environment, recognize faces and facial expressions, and hear snippets of text as it appears in front of the camera.<sup>73</sup> Or, speech-to-text—already shown to outperform professional lip readers—can help deaf people access spoken language at the same rate as hearing people, from the classroom to the boardroom.<sup>74</sup> And autonomous vehicles will provide freedom for people constrained at home by their disabilities. Freedom to get to their jobs and their social activities independently, combating loneliness and isolation.<sup>75</sup> These are just the beginning of the accessibility possibilities; with over one billion people with disabilities worldwide, AI applications like these will transform a lot of lives.<sup>76</sup>

AI is also being applied to eradicating world hunger and malnutrition. According to the United Nations, humanity will need to increase food production by 70% if we want to eliminate hunger by 2050.<sup>77</sup> Meanwhile, a staggering one third of all food produced today is lost or wasted.<sup>78</sup> Solving this problem will require more food production and less food waste. And we have the technology to do it. AI is optimizing and reimagining food production, distribution and consumption processes at every juncture. It is improving crop yield while using fewer resources.<sup>79</sup> It is diagnosing diseased crops early, preventing spread.<sup>80</sup> It is forecasting when and where famines will occur.<sup>81 82</sup> It is helping manage supply chains for efficient logistics and greater quality.<sup>83</sup> It is dynamically pricing produce to reduce spoilage.<sup>84</sup> It is designing food waste out of the system.<sup>85</sup>

The fight against hunger is inextricably tied to a bigger crisis—climate change.<sup>86</sup> Without drastic intervention, climate change will make our planet unlivable. Extreme weather events (wildfires, lethal heat waves, droughts, floods, hurricanes, severe storms, etc.) will multiply to catastrophic effect. Fresh water will become increasingly scarce. Farmable land will shrink. And by 2050, there could be as many as one billion climate refugees.<sup>87</sup> Sustainable environmental solutions are urgently needed; the clock is ticking. AI and machine learning will be a powerful tool in the fight for our planet, helping to tackle some of the most complex and vital problems, including climate prediction, building energy-efficient buildings and cities, capturing and removing carbon dioxide, creating low-carbon electricity and greening transportation, among many others.<sup>88</sup>



**Figure 30:**

Top Domains for AI and Machine Learning to Combat Climate Change<sup>89</sup>

Our health is another field where AI is making a profound difference. It is revolutionizing healthcare through everything from finding new links between genetic codes to operating surgery-assisting robots. Medical data is doubling every 73 days—it simply needs AI and machine learning to unlock its vast potential for breakthroughs, diagnoses, treatments and cures.<sup>90</sup> Using such data, and supported by the insight of human doctors, AI is already better and faster at detecting—or even predicting—diseases.<sup>91</sup> This includes diagnoses ranging from heart disease, to cancer, to rare conditions doctors are not as familiar with.<sup>92,93</sup> On the pharmaceutical side, AI is helping discover and design new drugs, as well as find new applications for existing drugs. In just one example, AI-driven research combined with traditional R&D is accelerating the discovery of treatments for Parkinson’s disease and other neurological disorders.<sup>94</sup> AI is also capable of personalizing the healthcare experience, improving patient outcomes across the sector. With AI in our corner, we will be living longer, healthier lives.

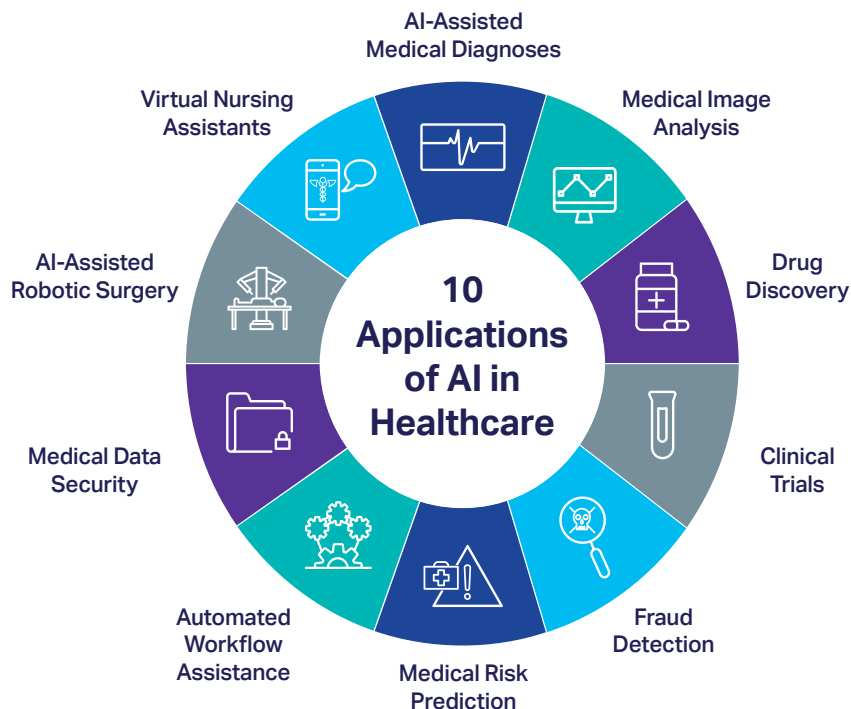


Figure 31:

AI Applications in Healthcare<sup>95</sup>

The value of AI in a healthcare context was truly brought home during the coronavirus pandemic that swept the world in 2020. AI is (as of this writing) being used in a variety of high impact applications to address the crisis, from the smallest molecular scale to largescale societal use-cases. AI is helping us to better understand the molecular structure of the virus and its impact on the human body, in order to improve diagnosis, treatment and vaccines.<sup>96</sup> It is triaging COVID-19 patients in hospitals faced with staff and space shortages.<sup>97</sup> Supporting medical imaging. Predicting patient outcomes based on electronic health record data. Tracking the disease, its spread and its evolution through the population. And, playing a critical role in epidemiological research modeling and forecasting.<sup>98</sup>

Beyond even this, an AI designed to look for influenza outbreaks discovered the coronavirus pandemic when it was in its earliest stages; *when it still could have been contained*.<sup>99</sup> Next time, AI will predict pandemics—and other crises—before they happen, giving us even more time to react.<sup>100</sup> Such predictive power will be the ultimate game-changer.

These examples only scratch the surface of the amazing things this technology can achieve. But to reach the best possible future, for all of humanity, we must inject human values into AI.

Artificial intelligence is still a nascent technology. As its capabilities expand, and with the human oversight to entrench humanitarian means and aims, the question becomes: is there any limit to what we can accomplish?

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