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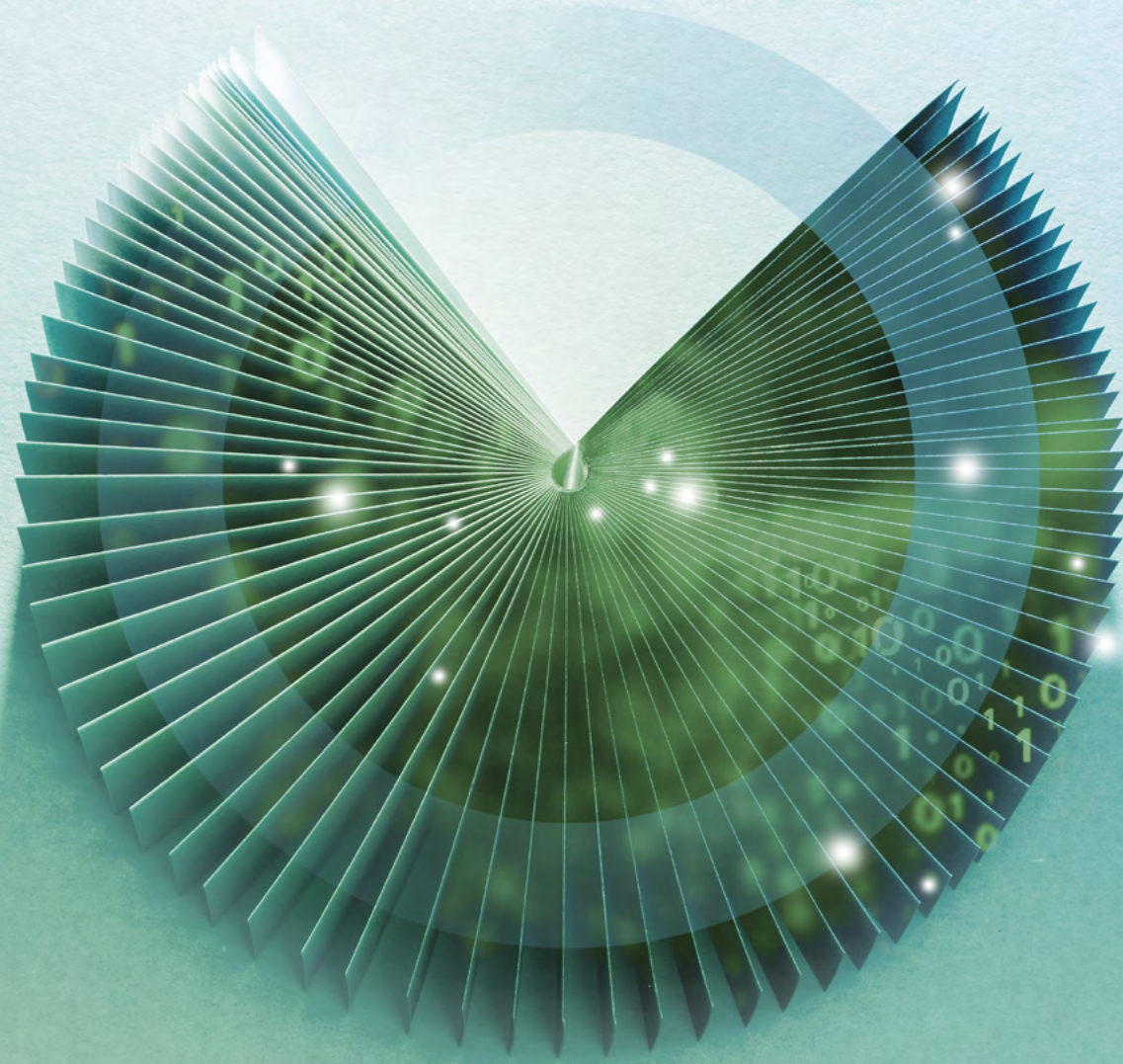
The AI Dossier—Expanded

Managing risk and trust for the top uses for AI in every major industry

By Deloitte AI Institute

About the Deloitte AI Institute

The Deloitte AI Institute helps organizations connect all the different dimensions of the robust, highly dynamic, and rapidly evolving AI ecosystem. The AI Institute leads conversations on applied AI innovation across industries, with cutting-edge insights, to promote human-machine collaboration in the "Age of With."

The Deloitte AI Institute aims to promote the dialogue and development of artificial intelligence, stimulate innovation, and examine challenges to AI implementation and ways to address them. The AI Institute collaborates with an ecosystem composed of academic research groups, start-ups, entrepreneurs, innovators, mature AI product leaders, and AI visionaries to explore key areas of artificial intelligence including risks, policies, ethics, the future of work and talent, and applied AI use cases. Combined with Deloitte's deep knowledge and experience in artificial intelligence applications, the Institute helps make sense of this complex ecosystem, and as a result, delivers impactful perspectives to help organizations succeed by making informed AI decisions.

No matter what stage of the AI journey you're in: whether you're a board member or a C-Suite leader driving strategy for your organization, or a hands-on data scientist bringing an AI strategy to life, the Deloitte AI institute can help you learn more about how enterprises across the world are leveraging AI for a competitive advantage. Visit us at the Deloitte AI Institute for a full body of our work, subscribe to our podcasts and newsletter, and join us at our meet-ups and live events. Let's explore the future of AI together.

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What's inside

Introduction

After decades of seeming like science fiction fantasy, artificial intelligence (AI) has made the leap to practical reality and is quickly becoming a competitive necessity. Yet, amid the current frenzy of AI advancement and adoption, many leaders and decision makers still have lots of questions about what AI can actually do for their businesses.

This compendium highlights 70 of the most compelling use cases for AI across six major industries:

- **Consumer** (which includes Consumer Products, Retail, Automotive, Lodging, Restaurants, Travel, and Transportation)

- **Energy, Resources, and Industrial** (ER&I)

- **Financial Services** (FSI)

- **Government & Public Services** (GPS)

- **Life Sciences & Health Care** (LSHC)

- **Technology, Media, and Telecommunications** (TMT)

For each of these industries, we describe several business-ready use cases for AI-related technologies—examining key business issues and opportunities, how AI can help, the possible benefits that are likely to be achieved, and some of the ethical considerations to weigh. We also present several additional AI use cases that are expected to have a major impact on the industry's future.

Of course, the best uses for AI will likely vary from one company to the next, and there can be many compelling use cases for AI beyond the 70 highlighted here. However, reading through this compendium should give you a much clearer sense of what AI is capable of achieving in a business context—now, and over the next several years—helping you make smarter decisions about when, where, and how to deploy AI within your organization. And how much time, money, and attention you should be investing in it today.

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Six ways that AI creates business value

Looking across all AI use cases, there are generally six major ways that AI can create value for a business:[1]

Cost reduction

Applying AI and intelligent automation solutions to automate tasks that are relatively low-value and often repetitive can reduce costs through improved efficiency and quality.

Example
Automating data entry and patient appointment scheduling using natural language processing.

Speed to execution

Reducing the time required to achieve operational and business results by minimizing latency.

Example
Accelerating the process of drug approval by using predictive insights to create a synthetic trial.

Reduced complexity

Improving understanding and decision making through analytics that are more proactive, predictive, and able to see patterns in increasingly complex sources.

Example
Reducing factory downtime by predicting machinery maintenance needs.

Transformed engagement

Changing the way people interact with technology, enabling businesses to engage with people on human terms rather than forcing humans to engage on machine terms.

Example
Using conversational bots that can understand and respond to customer sentiment to address customer needs more effectively.

Fueled innovation

Redefining where to play and how to win by using AI to enable innovative new products, markets, and business models.

Example
Recommending new product concepts and features based on customer needs and preferences mined from social media.

Fortified trust

Securing a business from risks such as fraud and cyber—improving quality and consistency while enabling greater transparency to enhance brand trust.

Example
Identifying and anticipating cyber attacks before they occur.

Managing risk and trust for AI use cases

New technologies can present new risks, and in AI, identifying and managing risk can be particularly challenging. AI is still maturing as a technology, use cases are often novel, and every enterprise and industry contends with unique assets, goals, and business priorities. No matter that challenge, the stakes are high. AI outcomes can impact the quality of customer engagements, operational efficiency, brand reputation, compliance, cybersecurity, and more.

As a result, organizations deploying AI should consider where risks exist and take steps to promote the trustworthy application of AI. It begins with an understanding of the qualities of trust that are relevant to a use case. Deloitte's Trustworthy AI™ framework[2] defines several dimensions:

- *Fair and impartial.* AI outputs are unbiased by virtue of treating the data for latent bias and managing the tool to mitigate and prevent unfair outcomes.

- *Robust and reliable.* The tool's outputs are consistent over time, even when functioning in less than ideal conditions or when encountering novel or unexpected data that was not contained in the training and testing data.

- *Transparent and explainable.* Stakeholders are aware they are interacting with AI and how their data is being used, and the way the AI functions and its implications for the stakeholder can be explained in a meaningful way.

- *Safe and secure.* The AI supports (or does not imperil) human safety, and the way the AI functions, as well as the underlying data, is protected against bad actors who would steal from or corrupt the system.

- *Respectful of privacy.* The data used to train and test AI is gathered and used with consent, personal information is obscured or removed, and the model functions in a way that does not divulge sensitive data or collect data it does not need.

- *Responsible and accountable.* Stakeholders are confident that deploying AI can be done responsibly, having considered the potential negative outcomes, and all participants in the AI lifecycle understand their individual accountability for AI outcomes.

In trustworthy AI, each dimension is treated via a larger AI governance structure that aligns stakeholders, organizational processes, and complementary technologies to mitigate risk and promote trustworthy AI use. This approach can be used to help support regulatory compliance as well as self-regulation that keeps AI in line with enterprise values and priorities.

Importantly, just as no two AI models and applications are identical, the priorities for each deployment can vary. The challenge for organizations is to determine which trustworthy dimensions are relevant and then rely on governance to maximize trust and value. To exemplify a structured approach to treating AI ethics, for each of the business-ready AI use cases described here, Deloitte's Trustworthy AI™ framework can be used to probe some of the considerations and questions that may arise during the AI lifecycle.

Key AI technologies[3]

Machine learning

With machine learning technologies, computers can be taught to analyze data, identify hidden patterns, make classifications, and predict future outcomes.

Deep learning

This is a subset of machine learning based on a conceptual model of the human brain known as neural networks. It's called deep learning because it involves neural networks with multiple layers that interconnect.

Natural language processing

This is the ability to extract or generate meaning and intent from the written or spoken word.

Computer vision

This is the ability to extract meaning and intent from visual elements, whether images (such as faces, objects, scenes, and activities) or alphanumeric characters (in the case of document digitization).

The Consumer AI Dossier

The Consumer industry, as we view it, encompasses a wide range of businesses including Consumer Products, Retail, Automotive, Lodging, Restaurants, Travel, and Transportation. What these seemingly disparate businesses have in common is a strong and defining focus on serving customers—and a common set of current and future business issues they are solving for.

Consumer-related businesses are actively exploring ways to harness the power of AI, and many valuable use cases are emerging. However, AI adoption and maturity levels vary widely for a variety of reasons, including scalability due to data quality and complexity, organizational constructs and talent scarcity, and lack of trust.

For most organizations, however, the biggest challenge is moving from concept to scale. For consumer-related businesses, this challenge can be particularly difficult since many have large legacy data and analytics platforms, decentralized data and analytics operations, and (in many cases) decentralized authority and responsibility—whether across business units, or even more so, across independently operated franchises. This often leads to data being inconsistent, poor quality, and limited in usability, which can be a big problem for AI systems, which tend to be extremely data-intensive (with the quality of the input having a direct impact on the quality of the output).

Another common obstacle is achieving alignment and integration across business and IT stakeholders. Often, AI is used in isolated pockets of the organization—sometimes working with IT, sometimes not. However, in order to achieve the full benefits of AI at scale, an integrated business and technology plan (and case for change) is important.

Similarly, in many organizations there continues to be a lack of trust in AI and what it can and should be allowed to do. Tackling this issue should include a coordinated change management approach for communicating with leaders and teams and hearing and addressing their concerns. For businesses without direct control over this critical element, deploying AI at scale can be difficult to achieve.

9

The Consumer AI Dossier

Over time, the task of building trust in AI will likely get easier as AI technologies become more widely accessible—and accepted—for businesses and consumers alike. Every successful AI deployment fuels a virtuous cycle that improves people's understanding of what AI can do and helps expand the scale and scope of future AI use cases. Also, because these learning algorithms and solutions reduce the effort it takes to deliver insights and decisive action, the resulting operational improvements typically increase confidence and drive increased return on investment.

Looking ahead, AI systems for consumer-related businesses are expected to become increasingly autonomous—changing the way companies move goods, enabling increased mobility, and transforming how they manage their workforces—while at the same time becoming increasingly interconnected across entire ecosystems, enabling AI to add value to business processes from end to end.

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More than fleeting improvements
(Fleet Network Optimization)

Use AI and machine learning to create optimized network plans for ground and air fleets—maximizing efficiencies within and across business lines.

Issue/Opportunity

Inefficient network plans cost companies millions of dollars every year. Yet, according to the Journal of Commerce, 85% of shippers and consignees believe their industry has been significantly slower than other industries at implementing new technologies.

How AI can help

Optimize fleet utilization and empty repositioning
Companies can use machine learning and predictive analytics to optimize their fleet utilization and empty repositioning. Initially, this can be done through a human-in-the-loop approach, with AI models providing recommendations for drivers and planners to implement. However, as the models learn over time, the optimization process can evolve to become more automated and prescriptive.

Enable real-time decision-making
AI systems can pull in and process a wide range of data in real time—including information about traffic, weather, road conditions, and other data-in-motion. This can be used to automate change processes and/or enable drivers and planners to efficiently make optimal decisions in the face of unexpected circumstances.

Capitalize on IoT
AI-based IoT enables better, more informed downtime predictions. Machine learning models can use those improved predictions to optimize fleet usage and operations in real time.

11

More than fleeting improvements
Managing risk and promoting trust

Reliable
Models may be susceptible to the risk of fading reliability through data drift or concept shift. Managing this risk is important because it can affect confidence in decision making for fleet optimization. End users need to be able to trust that the model will perform at a consistent level of accuracy, even in less-than-ideal conditions. Reliable AI emerges from approaches such as designing and training for consistency, interrogating datasets, and evaluating error rates in predictive accuracy.

Explainable
Risks resulting from AI can be crosscutting, impacting multiple areas of the business. Think through explainability in terms of what each stakeholder needs to understand about a deployed model to perform their work. The COO, CDO, CFO, and others may each require different kinds of knowledge to effectively identify and address AI risk. Supplementary tools enabling AI explainability could be valuable for audits and helping developers better create and optimize the models.

Accountable
Although a model may reach a point where optimization is automated and prescriptive, there are still human stakeholders who answer for aspects of the AI lifecycle (e.g., testing, monitoring and post-deployment management), as well as the impact from model outputs. An AI tool cannot be held accountable for poor outcomes. Defining, documenting, and communicating accountability can help support stakeholder awareness of their role in addressing AI risk.

Possible benefits

Increased efficiency and profits
AI can help a company efficiently scale its operations within and across its global ground, air, and sea fleets— boosting efficiency and profits.[4]

Reduced downtime and maintenance costs
AI technologies can reduce costs and downtime related to maintenance.

Higher revenue
AI can help improve fleet positioning to better meet demand and maximize revenue.

Next-level personalization
(Connected Customer)

Personalize and improve the customer experience through consolidated platforms that harness the power of AI, machine learning, and natural language processing.

Issue/Opportunity

According to Gartner, customer service and support is one of the largest segments of CRM, comprising 36% of the CRM market in 2018.[5] Yet, despite the segment's size and maturity, companies need to continue actively keeping pace with their competitors in order to provide consistent customer service across multiple levels, maintain customer loyalty, and prepare for disruption from the new digital business ecosystem. Throughout the customer journey and lifecycle, it is now possible to personalize the customer experience across all channels using machine learning, conversational AI, and natural language processing.

How AI can help

Automate customer interactions
Chatbots and virtual customer assistants have become hot topics for organizations looking to redesign and upgrade their customer service experiences.

Use IoT to sense customer sentiment and needs
Consolidated customer service platforms based on AI and IoT enable customer service providers to sense the sentiments and needs of connected customers.

Personalize the customer experience
Using machine learning and data-in-motion, companies can provide real-time recommendations and decision support that enable a tailored customer experience before, during, and after each interaction—improving customer lifetime value and loyalty.

01
02
03
04
05
06
07
08

Next-level personalization
Managing risk and promoting trust

Transparency
Consider risks arising from customer reactions when interacting with AI. Is it evident to customers that they are engaging with a chatbot or virtual assistant? Think through the implications arising from the customer discovering (or failing to discover) that they are interacting with a machine. Relatedly, it may also be important to tell the customer which data is being collected, analyzed, and stored.

Robust and reliable
When AI consistently works as intended, it can help promote a positive customer impression, whereas inconsistent function could lead end users to conclude that the AI is deployed so the enterprise can avoid (rather than help) the customer. While ensuring reliability, the model also should be sufficiently robust so it can respond to different customer personas.

Privacy
There is a growing body of regulations and laws that cover how personal information can be collected, transferred and used. At the same time, personalization requires rich data about an individual, and when interacting with an AI, customer reactions may be recorded and processed. Consider whether the data is used in such a way that it treads across laws, regulations, or common privacy expectations.

Possible benefits

Increased revenue
Greater awareness of customer needs and wants can drive higher revenue.

Better customer experience
Deeper understanding of problem patterns and issues can help companies improve the customer experience.

Lower costs
AI and machine learning can be used to handle routine tasks, enabling customer service centers to operate more efficiently at reduced cost.

01
02
03
04
05
06
07
08

Mix and match
(Items Assortment Planning Optimization)

Use AI to determine which items should be stocked or substituted to optimize sales, margins, inventory, and customer satisfaction.

Issue/Opportunity
The traditional approach to assortment optimization is costly, slow, prone to human error, and does not maximize profitability and sustainable growth—relying on once-a-year manual reviews that cannot keep pace with the rapidly evolving expectations of today's consumers. Using AI for assortment optimization can help a retailer make better, more sustainable decisions on how to efficiently provide customers with the products they need.

How AI can help

Predict consumer demand and next actions
AI analytics can predict consumers' next actions and their responses to market trends based on past purchasing behavior. This allows retailers to have a better understanding of which items are expected to be in high demand, enabling more informed decisions about which items to prioritize for stocking.

Analyze customer data from a wide range of sources
Neural networks can mine and analyze data from relevant brands, competitors, and social media and then compare those insights against the spending behavior of a retailer's customers—helping to generate more accurate assortment forecasts at lower cost. Also, the algorithms can automatically update their results when the data changes, enabling retailers to track consumer expectations in real time.

01
02
03
04
05
06
07
08

15

Mix and match
Managing risk and promoting trust

Robust and reliable
Valuable forecasts are accurate in the face of novel or unfamiliar data. What degree of accuracy is necessary for an organization and its AI application? Can an AI model remain consistent over time, despite the volume and velocity of customer data? The degree of predictive accuracy can help an enterprise rapidly adjust in the face of systemic shocks or step-changes.

Explainable
Risks to inaccurate decision making may emerge if stakeholders do not have a complete understanding of how AI deployment impacts their area of the enterprise. For example, since the model impacts forecasts around things like revenue and inventory needs, the CFO may need a deep understanding of how the model works in order to trust it. The same is true for other stakeholders throughout the organization.

Accountable
Establishing and communicating accountability can help equip stakeholders with an appreciation of their roles in furthering trustworthy AI and mitigating the risk of poor AI outcomes. If stocking decisions based on AI-fueled assortment planning are mismatched with customer demand, who is accountable for the error and associated costs and consequences? What does accountability mean in the context of a retailer's AI assortment optimization (e.g., demotion, required training)?

Possible benefits

**Assortment planning that
is more timely and less costly**
By using AI technologies to automate the assortment planning process, retailers can analyze consumer expectations in real time while avoiding the operational costs of yearly manual reviews.

Better decisions about what to stock
AI can generate more accurate product recommendations, enabling retailers to make smarter decisions about what to stock.

Closing the loop on supply and demand
(Consumer Demand Planning, Forecasting, and Marketing)

Use AI to augment marketing and improve demand planning and forecasting.

Issue/Opportunity

As the number of sales channels used by consumers continues to grow, retailers should continue to improve how they plan across multiple sales channels—and how they handle disruptions. This typically requires improved demand-planning and replenishment capabilities that harness the power of AI. In the past, marketing solutions could only make decisions based on a fixed set of assumptions and narrowly defined inputs and outputs. Although such solutions can provide useful insights on a macro level, they are often difficult to scale and largely lack the ability to look at audience specifics. However, thanks to AI, marketers now have the opportunity to analyze consumer mannerisms on a much more detailed level.

How AI can help

Understand consumer demand
AI can be used to understand consumer demand more deeply by analyzing a wide range of factors such macroeconomic elements and competitor activities.

Define segments much more precisely
AI allows marketers to create hyper-focused, segmented groups out of their audiences, generating deeper insights and increasing the connections between data points.

Analyze product clusters
AI can examine clusters of products and reveal hidden demand patterns for similar and contrasting product groups.

Automate decision-making
AI can help automate planning decisions that involve clear cause-and-effect relationships, allowing planners to focus their time and attention on more complex situations where causality is less evident.

01
02
03
04
05
06
07
08

17

Closing the loop on supply and demand
Managing risk and promoting trust

Robust and reliable
Erroneous forecasts can lead to poor decisions yielding risks to a business. Validating AI performance in demand planning and forecasting can give human decision makers confidence in the outputs and trust in the insights around consumer demand. Trustworthy models are reliable across time, and they are robust and accurate even in the face of unexpected data.

Fair and impartial
Bias in the data can impact AI outputs, such as varying levels of accuracy for different customer segments, which can in turn lead to inaccurate forecasts. This risk can be mitigated. When amassing customer data from a variety of sources, consider whether there is sufficient visibility into secondary data to understand how it was collected and whether it contains bias.

Security
Personalized marketing relies on large amounts of customer data that could be valuable to cyber criminals. Whether due to laws, regulations, or business concerns around customer trust, explore how the underlying data and every aspect of the AI ecosystem is secured against attacks, as well as inadvertent data exposure.

### Possible benefits

Unprecedented levels of personalization
AI enables marketers to process and analyze massive amounts of data and get to know consumers at the individual level.

Improved supply chain performance with fewer stockouts
Machine learning in demand planning and forecasting can help businesses maximize revenue, improve margins, and optimize inventory while minimizing occurrences of products going out of stock due to unanticipated demand.

Improved decision-making
AI technologies can help business leaders improve their decision making—and enable simpler, less important decisions to be made more quickly.
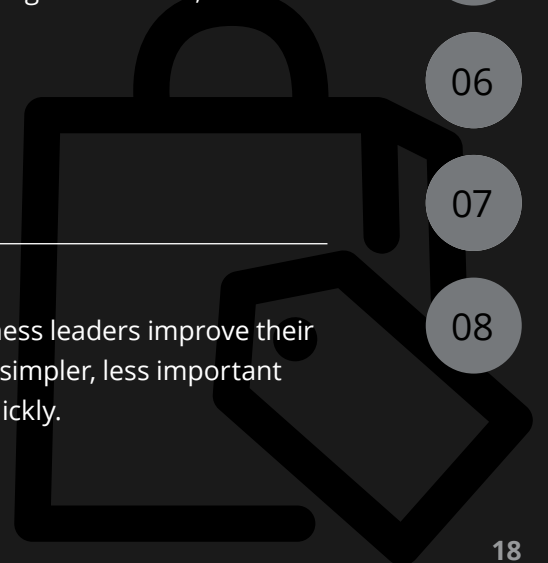
Customer contact in the AI era
(Digital Contact Center)

Use AI technologies such as natural language processing and machine learning to improve the contact center experience and overall customer satisfaction.

Issue/Opportunity
Interactions with contact centers can have a huge impact on customer satisfaction and loyalty. Yet, because of the pandemic, today's contact centers face bigger challenges than ever, including higher work volumes, lower IT budgets, and significant labor shortages.

Contact center automation, which has been steadily improving for years, can help address those challenges. However, until now, most IVR systems and chatbots have relied on basic word recognition and simple file retrieval—and were not sensitive to the context of a discussion—giving customers a sub-optimal experience.

A digital contact center that uses AI technologies, such as natural language processing and machine learning, can be more predictive and sophisticated, significantly improving the customer experience while reducing the need for human involvement.

How AI can help

AI technologies such as natural language processing and machine learning enable contact center systems to be more sophisticated and predictive, significantly improving the customer experience while reducing the need for 24/7 human involvement, allowing customer service representatives to focus on more value added tasks.

Voice Virtual Assistants
AI-based natural language tools and machine learning models can be used to build Voice Virtual Assistants that deliver a more efficient, engaging, and human-like customer experience. These tools can train chatbots to answer questions, schedule appointments and calls, and refer customers to the department most appropriate to handle their requests.

Intelligent follow-up
Real-time analytics using AI technologies can inform contact centers about when to follow up on prior customer interactions.

Omnichannel quality management
Using predictive analytics and sentiment analysis, all interactions on all digital channels can be monitored, providing valuable insights about both customers and contact center staff. This can give managers real-time information for retraining workers or deciding on the next best action for customers.

01
02
03
04
05
06
07
08

19

Customer contact in the AI era
Managing risk and promoting trust

Transparent
Whenever humans and AI interact, consider whether the customer is aware they are engaging an AI. Is awareness necessary for all customer interactions, or is it most important for complex queries and less so for simple automated tasks (e.g., scheduling an appointment)? Also consider whether the customer knows which data is being collected, stored, and analyzed by virtue of interacting with AI.

Reliable
Inaccurate voice assistant outputs during a customer engagement can create the risk of a negative impact on customer sentiment and trust in the organization. Many chatbots not only respond to new inputs (inference) but also learn from them (training). Interaction with end users (such as angry customers) can have unforeseen consequences, potential leading the chatbot to sharpen or intensify its tone.

Accountable
Risks proliferate when stakeholders in the AI lifecycle do not uphold their individual accountability for AI outcomes. When it comes to customer contact, accountability may lay across several people or groups in the organization, such as in marketing and IT. Risks can be mitigated by documenting and communicating accountability to relevant stakeholders. Human managers also need a feedback mechanism to ensure automated advice is accurate.

Possible benefits

Improved customer satisfaction with less manual involvement
AI can help boost overall contact center performance metrics (including customer satisfaction), while reducing the amount of manual intervention required to address customer queries.

Lower costs
Less manual intervention can mean lower operating costs, since the workforce required to support AI-enhanced call centers can be significantly smaller.

More efficient interactions
For some queries, interacting with AI-based bots is more convenient and efficient than working with a human agent, resulting in a better customer experience.

The future of shopping
(Autonomous Stores)

Using AI to automate retail outlets, allowing them to operate unattended.

One of the biggest challenges for brick-and-mortar retailers is finding ways to match the cost efficiency of their online competitors while continuing to differentiate themselves by offering a local experience that is hands-on and satisfying. With autonomous stores, deep learning software—in conjunction with cameras and sensors—can recognize everything that is happening within a store (including people's movements, expressions, and actions), making it possible for the store to remain fully stocked and operational with little or no human involvement. It can be a near-perfect combination of full service and self-service.

01
02
03
04
05
06
07
08

Are we there yet?
(Autonomous Driving)

Using AI to operate vehicles autonomously.

For many people, driving is a chore they would rather avoid. And for many companies, trucking and other driving-related activities are just costs of doing business that eat up precious resources and expose the organization to significant risk. AI is on the verge of dramatically improving the driving experience—with human drivers strictly optional. Autonomous driving combines onboard sensors and localization technologies with AI-based decision models that are designed to reduce human error and make smarter, more informed decisions about steering, braking, and navigation. The goal is to create driving capabilities that are safer, cheaper, and more efficient—reducing accidents and freeing up humans to focus on activities that are more valuable and satisfying.

Fits and smarts

(Fashion Tech)

Using AI to instantly determine which clothing items are the best fit for a customer's particular size and body shape.

Finding items that fit is one of the worst parts of clothes shopping. From a consumer's perspective, it can be a time-consuming hassle during the purchase phase—and all too often leads to dissatisfaction and return hassles as well. From a retailer's perspective, it can arguably be an even bigger problem, requiring large inventories of sizes and styles, sales clerks with sufficient experience and expertise tend to steer customers toward the right items, unhappy customers, and the time and expense of dealing with returns. Systems that incorporate machine learning, computer vision, and 3D scanning can help minimize the problem by obtaining a shopper's measurements in real time simply by having them stand in front of a camera. Those measurements can then be matched against a database of clothing to find the best fit, improving customer satisfaction and reducing the cost of returns.

Health your way
(Personalized Health, Fitness, and Wellness)

Using AI with wearable and non-wearable devices to monitor people's health and provide real-time feedback and coaching.

Imagine a world where every individual's health and wellness experience could be tailored to that person's unique needs—in real time—while also benefiting from the collective knowledge and experience gained from everyone else. With machine learning and other AI technologies, systems can be trained over time based on data from millions of users, enabling data-driven, personalized coaching that drives behavior change and helps manage and prevent chronic diseases. That's the future of health and wellness, and with the latest advances in AI (and the proliferation of devices such as smartwatches) it's already starting.

The paradox of AI personalization

(Service Experience Modernization)

Using AI to transform the customer service experience (and how service is delivered), in many cases allowing customers to be served automatically and effortlessly.

It's ironic to think that introducing more machines and AI technologies into the customer service experience could actually make it more personal. But that's exactly what's happening. By applying AI across the entire customer journey, customer service experiences, processes, and interactions are evolving from human-human to human-machine and ultimately machine-machine, enabling customers to be served in ways that are increasingly convenient, efficient, and effective—and, paradoxically, increasingly personal, with each individual's needs being addressed automatically and autonomously.

The Energy, Resources & Industrials AI Dossier

AI adoption and deployment seem to be less extensive and mature in Energy, Resources & Industrial (ER&I) than in most other industries. So far, there have been fewer big AI success stories in ER&I—and thus less competitive pressure to take immediate action. Although most ER&I companies generally acknowledge the importance of AI—and see it is an essential and disruptive capability that could greatly affect their ability to operate and compete in the future—most efforts to date have been limited to small-scale pilots and proofs-of-concept focused on narrow parts of the business.

The main challenges to increased AI adoption and deployment largely revolve around data. Unlike many other industries where digital data plays a central role, ER&I still revolves around physical work and physical assets—with many of those assets geographically scattered and disconnected from digital networks. Widespread deployment of IoT-related technologies is starting to fill this data void. However, in order to be useful, the resulting data needs to be organized, captured, and analyzed in a timely manner. Also, edge computing and edge AI technologies should be harnessed to enable timely processing and analysis of data in dispersed locations at the edge of the network.

For most ER&I companies, the immediate and important next step is to establish an internal team with expertise in AI, data science, and data engineering to serve as a focal point for all AI-related activities and investments. This team would coordinate AI activities across the company's business ecosystem, while providing a core set of internal AI resources and capabilities that can be supplemented from the outside as needed. Also, the team would provide a broad, balanced, and informed perspective on using AI across the enterprise.

Too many AI initiatives and visions in ER&I are either overly tactical and technical (too narrowly focused, and often highlighting technical capabilities that are exciting but not very useful), or overly strategic and ambitious (too difficult and expensive to implement, requiring data and advanced capabilities that don't currently exist). To succeed with AI, ER&I companies should have strategies and roadmaps based on a practical understanding of what parts of the business are best suited for AI.

One early and ongoing focus area for AI in ER&I is making machine maintenance more predictive and less reactive. Another key focus area that is getting a lot of traction these days is using AI to improve interactions with customers and field workers. Also, some ER&I companies are starting to explore the use of AI to help them handle extreme weather and other hard-to-predict events. By harnessing the power of AI vision and other advanced AI technologies, companies can monitor and analyze vast amounts of information—including data from field sensors, drone video, and weather radar—with a level of timeliness, accuracy, and thoroughness that humans alone simply cannot achieve.

Expanding on the idea of machines helping humans be more efficient and effective, AI's single biggest impact in ER&I could be helping companies address the future workforce gap. The federal government's multi-trillion dollar commitment to infrastructure is expected to dramatically increase business activity throughout ER&I, but could also create a significant shortage of workers and expertise. AI can help address this gap by augmenting the work done by humans—doing much of the preparatory analysis and heavy lifting so human workers can focus on activities that require skills and expertise that are uniquely human.

01

02

03

04

05

06

07

08

By harnessing the power of AI vision and other advanced AI technologies, companies can monitor and analyze vast amounts of information.

Keeping downtime down
(Predictive Machine Maintenance)

Use AI to optimize industrial machine performance, predict failures, and inform maintenance requirements with IoT-powered asset monitoring.

Issue/Opportunity

Machine maintenance is typically a significant source of cost savings, as the cost of unplanned downtime for industrial manufacturers is approximately $50 billion annually.[6] Preventative maintenance for plant assets has traditionally relied on mean-time-to-failure to determine when maintenance should be scheduled (with breakdowns and failures noted in service logs to analyze historical performance). However, with the industrial IoT market growing—and IoT sensors becoming ubiquitous in factories—industrial manufacturers now have a valuable opportunity to use IOT data and AI to make smarter decisions about when machines should be serviced or replaced, helping factories maximize production output at lower cost.

How AI can help

Better predict and plan for necessary maintenance and downtime
By monitoring machines and collecting feedback data in real time, AI technologies can analyze patterns for each machine to determine its actual maintenance needs and create a customized schedule that minimizes overall downtime on the factory floor. Also, as historical data is collected and analyzed, AI can help factory managers be increasingly proactive in scheduling downtime for maintenance.

Proactively identify and fix hidden quality problems
Over time, AI can learn to recognize patterns in IoT sensor data to identify which machine parts are most likely to fail. These results can be further analyzed to understand the correlation between critical parts' performance and the quality of product output. Armed with these AI-driven insights, factory managers can be more informed and precise about the parts for which they request maintenance, and can even provide feedback to help equipment manufacturers improve critical parts that fail frequently.

01
02
03
04
05
06
07
08

Keeping downtime down
Managing risk and promoting trust

Robust and reliable

Using AI to find patterns in sensor data could present the model with novel or unexpected information. To trust that the AI outputs for predictive maintenance are accurate, the model should be able to function as intended regardless of the sensor data it encounters. In the physical world, practitioners should manage for model drift, as production settings can imperceptibly deviate from circumstances at the time of model training.

Explainable

If users do not understand how the model works, they may use it incorrectly, leading to new problems that can inhibit trust. There are a range of stakeholders who may use or rely on an AI for maintenance and downtime planning, and each stakeholder may require a different level of AI understanding. Maintenance teams may only need to understand what to do with AI outputs, while factory managers may require a deeper understanding of AI function.

Possible benefits

Lower maintenance costs

Maintenance on plant assets remains a significant cost today, even with current best-in-class preventative maintenance measures. AI can enable a new level of maintenance efficiency and cost savings.

Proactive maintenance and reduced downtime

As IoT sensors become ubiquitous, the resulting troves of sensor data can be analyzed to better understand patterns in machine performance and critical points of failure, helping factory managers schedule downtime more proactively while reducing maintenance and labor costs.

01
02
03
04
05
06
07
08

30

AI at the edge
(Edge AI for Production and Planning)

Use IoT solutions based on Edge AI to streamline production and planning processes—and to reduce unexpected downtime.

Issue/Opportunity

The IoT market is expected to reach $2.4 trillion by 2027,[7] with adoption eminent for companies in IoT-heavy ER&I sectors. This breathtaking growth would enable a sharp increase in the volume and sophistication of data collection and actionable insights at factory, asset, and industrial endpoints. Higher data volume leads to increased latency, and can greatly increase the need for processing power and security at the edge of the network. To handle all of this new IoT data—and to process it in a timely and efficient manner—companies should consider IoT solutions that harness the power of edge computing and AI.

How AI can help

Run advanced computing algorithms at the edge of the network
Compact, GPU-enabled deep learning acceleration platforms (such as the DLAP x86 series) make it possible to run advanced computing algorithms without using cloud data storage or external computing systems.

Improve data security
Locally storing and processing data on edge devices can reduce the number of security vulnerabilities and can eliminate the need for third-party data storage solutions, which can be susceptible to cyberattacks.

Make IoT solutions less costly and more efficient
By eliminating the need for cloud storage and processing, Edge AI technology is typically much more cost effective than traditional IoT solutions, which require companies to account for the cost of storage in addition to the cost of hardware devices and network bandwidth.

Enable faster decision making
Faster data intake and AI processing at the edge enables complex decisions to be made quickly. For example, the time required to create geo-models for oil well placement can be reduced from months to hours by aggregating historical data, real-time sensor data, and geological models—all at the edge.

01
02
03
04
05
06
07
08

31

AI at the edge
Managing risk and promoting trust

Reliable
If an AI tool is not reliably accurate over time, it will likely not be trusted or deliver its full potential value. With Edge AI, consider identifying supplementary tools and processes for validating AI accuracy and to help ensure the functionality and accuracy consistently meets expectations. Look at how business processes can be amended to enable rigorous management and regular AI assessments that can validate the reliability of AI outputs after deployment.

Privacy
Privacy rules and legislation are emerging worldwide. While processing at the edge can help avoid common privacy and security challenges associated with cloud and third-party data storage, the enterprise is not necessarily absolved of legal and regulatory expectations for privacy, which can vary across geographies. Investigate privacy laws and rules on exporting data and Edge AI outputs, including by consulting with the organization's legal and compliance specialists.

Security
There are security risks to IP and data when using AI. Probe how security vulnerabilities in the IoT can impact the reliability of data and the accuracy of outputs. Is there a potential for compromised sensors or devices to divulge proprietary details of the Edge AI? Each smart sensor is a point of exposure, which can in turn imperil the entire system. Identify where edge computing fits as a component of an organization's cybersecurity apparatus.

Possible benefits

Competitive advantage
In the race for insights and innovation, companies need IoT solutions that can deliver sophisticated analysis quickly and efficiently at the edge of the network.

Timely, actionable insights at lower cost
Edge AI can provide a path to make the growing amount of IoT sensor data actionable for analysis at greater speeds and lower costs than traditional IoT technologies.

Improved operational efficiency with less downtime
Edge AI enables dozens of focused ER&I use cases that can streamline operational decisions and reduce unplanned downtime.

Making sense of sensor data
(Field Sensor Data Analysis)

Use AI technologies to analyze real-time data from networks of sensors in the field (combined with scientific knowledge models and information about various environmental/peripheral factors such as seismic activity, drilling logs, cores, completion designs, production data, and maintenance records).

Issue/Opportunity

The multidisciplinary nature of downstream oil and gas operations requires analysis of real-time sensor data combined with scientific knowledge models. Similarly, upstream energy operations require intensive analysis of complex and unstructured data—such as spatial, geological, geophysical, and chemical data—to monitor production assets and assess opportunities for exploration and drilling.

How AI can help

Monitor field assets in real time
Downhole sensing technologies such as fiber optics can transmit a huge amount of real-time data to inform how oil wells and pipelines are performing. Through anomaly detection and predictive modeling, this data can be quickly analyzed to alert operations about leaks or malfunctions—and to forecast daily gas production from wells.

Identify and assess opportunities for exploration
Sophisticated systems, such as cognitive discovery platforms, can combine geologic data from field sensors with existing public and private databases and scientific models to create knowledge graphs. Machine learning algorithms can then be applied to these knowledge graphs to identify opportunities for hydrocarbon exploration and assess the associated financial risk.

Making sense of sensor data
Managing risk and promoting trust

Accountable

Asset monitoring with AI may provide for a safer operating environment, but if an organization comes to rely on such a solution, who is accountable if it fails and yields negative consequences? Are there degrees of accountability across the organization and AI lifecycle? Is this documented and communicated? Determine who is tasked with managing and using the tool and their accountability for its performance.

Explainable

Machine learning is valuable for uncovering patterns, but stakeholders may be challenged to understand how those patterns are found and why they are valid, which can hamper trust in the tool. Even as the underlying calculations may be opaque, determine the different levels of knowledge required for stakeholders to use the solution, from the operational employees in the field to the data scientists in the lab.

Robust and reliable

AI accuracy can directly impact financial and safety risks. Enterprise risks can be mitigated with data analysis and predictive accuracy that remains accurate over time. Conversely, without a robust and reliable model, the tool may exacerbate or create new risks. To deliver its full value, AI should remain accurate in the face of changing operating conditions and field sensors recording new or unfamiliar data.

Possible benefits

Improved monitoring and forecasting
Applying AI techniques, such as anomaly detection algorithms and machine learning to field sensor data, can improve production asset monitoring and performance forecasting.

More confident exploration
Analyzing field sensor data with AI can provide a higher degree of confidence throughout the exploration process.

Fielding questions from the field
(Field Workforce Support and Safety)

Use AI technologies such as natural language processing (NLP) to give field workers easy access to critical information. Also, use computer vision and machine learning algorithms to sense dangerous working conditions and automatically generate alerts.

Issue/Opportunity
Given the risky and complex nature of oil and gas field work, repairmen, and rig workers; operators need timely, around-the-clock access to reliable information and support while on the job. Currently, most oil and gas workers rely on human-staffed call centers for information and emergency assistance. However, those call centers are costly to run 24/7, and do not provide consistent high levels of service.

How AI can help

Consolidate structured and unstructured data from multiple sources
Smart AI Assistant platforms can combine internal enterprise data with publicly available information from multiple sources in a wide range of formats, including: documents, spreadsheets, presentations, web pages, emails, and APIs.

Provide field workers with easy access to information
Field workers looking for targeted answers can access the consolidated data through web portals, mobile apps, messaging conversations, and smart speakers.

Support various use cases with conversational AI
Conversational AI can support field workers by applying natural language processing (NLP) to their information requests and then query a consolidated database of internal and external data to fetch the requested information. Typical uses in oil and gas include on-the-fly requests for safety guidelines, real-time statistics on well operation, details from meetings and emails, and business insights such as historical and projected operational costs.

01
02
03
04
05
06
07
08

35

Fielding questions from the field
Managing risk and promoting trust

Robust and reliable
This AI application requires a high level of reliability because of its safety implications. Unreliable or inconsistent outputs can create risks for people and assets. Monitor the accuracy of AI outputs and evaluate whether the model can achieve the commensurate level of information and support during an emergency situation that a human call center could deliver.

Transparent
With many professionals calling in from the field, consider whether employees should know that they are interacting with an AI-run call center. There may be degrees of transparency depending on the information and support needed with basic inquiries requiring little transparency and emergency situations demanding significant transparency.

Responsible
Cost pressures may be motivating factors in adopting digital assistants for field support, but given risks to the health and well-being of human employees, the organization should ask, is using this system a responsible choice? In adopting a new system, have there been tradeoffs for employee safety and if so, are they justifiable?

Possible benefits

More timely and reliable access to critical information
For field workers who need real-time access to critical information, AI technologies can provide answers, alerts, and insights in a more accessible and accurate manner than traditional call centers.

Greater convenience for field workers
Conversational AI can make it easy for workers to request information through a variety of field-friendly devices and channels.

01
02
03
04
05
06
07
08

Keeping the lights on
(Predictive Insights for Utility Service Outages)

Use AI algorithms and predictive analytics to forecast energy loads and peaks in demand—reducing service outages, and providing customers with more accurate timing and duration estimates for outages that cannot be avoided.

Issue/Opportunity

For utility companies, over-producing energy is costly and wasteful, as is storing energy over long periods of time. However, under-supplying leaves areas vulnerable to service outages during peak hours. Energy consumers increasingly expect a broader array of energy options with greater transparency and lower costs, placing pressure on utility companies to be more thoughtful about the products and services they offer.

How AI can help

Better prediction of energy demand and outages
Machine learning models can identify historical trends within energy markets to more accurately forecast loads and demand peaks, helping to ensure an adequate supply of energy. Other factors such as weather forecasts, event-based indexes, and supply-side constraints can be included in the models to not only predict demand, but also to predict the length and timing of service outages that cannot be avoided.

Proactively alert customers about expected outages and resolution times
Customers can benefit from predictive AI when their service providers are better equipped to handle demand peaks and other risk factors such as inclement weather. However, when service outages are unavoidable, predictive AI can also help utility companies issue warnings to their customers and keep them updated with expected resolution times.

Keeping the lights on
Managing risk and promoting trust

Robust and reliable

Predictive capabilities can deliver value for utilities and customers alike, but to trust the system it needs to be consistently accurate in anticipating constraints and managing supply and demand. A model's reliability over time and its robustness when encountering unexpected data can have a lasting impact on trust in the tool, and by extension, trust in the utility company's reliability.

Explainable

Amid the fast-changing data surrounding weather, supply and other events, service outages may be unavoidable, even when using an AI solution. In these cases, can the utility company determine concretely that the AI performed as intended but the outage was inevitable? Validating the model's performance can reveal whether the outage was inescapable or whether the tool fell short of its intended function.

Possible benefits

Fewer outages

Predictive analytics can help utility companies prepare for times of energy strain by considering real-time forecasts and historical data.

Improved customer service

Accurate predictive insights can improve customer service by enabling early outage warnings and accurate outage duration estimates.

Reduced operating and maintenance expenses

With AI, operating expenses (OpEx), such as labor and equipment costs related to outages, can be reduced and/or replaced with capital expenditures (CapEx) for AI technology assets.

Materials development in record time

(Materials Informatics)

Using AI and data management technologies to accelerate the development of materials and chemicals.

Developing innovative new materials and chemicals has traditionally been a complex, time-consuming process that requires a lot of guesswork, trial and error, and laborious manual research. But thanks to advances in AI, many of those steps are being streamlined or eliminated. The AI-powered process involves building and maintaining a comprehensive database of development data about materials and chemicals—automatically converting technical documents into a structured, searchable database—and then using machine learning and advanced analytics to mine the data and discover high performing compounds in record time. The AI models can predict the performance of new materials, chemicals, and formulations, and can suggest which experiments to run next—helping researchers avoid redundant experiments and quickly find relevant data sets. The potential? Developing new chemicals and materials at unprecedented speed.

Powering up energy production

(Energy Demand Forecasting and Management)

Using AI to monitor and analyze the data produced by energy systems. In recent years, rolling blackouts and brownouts have become more of a regular occurrence in some places—and the trend could get worse in the future.

Equipping buildings with sensors to track energy consumption—and then analyzing that usage data with AI and machine learning—can help uncover hidden demand and usage patterns, enabling utilities to minimize grid congestion and optimize pricing. It can also improve energy forecasting, energy management, sustainable energy development, regional energy planning, and can boost consumer energy awareness. All these enhancements can help bring energy supply and demand into alignment, making blackouts and brownouts a thing of the past.

Smarter supply chains
(Algorithmic Supply Chain Planning)

Using AI to improve supply chain transparency, optimize transportation routes, and minimize delivery disruptions.

The COVID pandemic vividly illustrated the devastating impact that unexpected events can have on global supply chains. Thankfully, AI can help the world avoid similar disruptions in the future. By crunching through the massive amounts of data being generated by today's supply chains, AI can predict a wide range of unexpected events—such as weather shocks, transportation bottlenecks, and labor strikes—helping to anticipate problems and reroute shipments around them. AI can also enable dramatic improvements in other key supply chain areas, including; demand forecasting, risk planning, supplier management, customer management, logistics, and warehousing. The potential results? Improved operating efficiency and working capital management, greater transparency and accountability, more accurate delivery estimates, and fewer supply disruptions.

A digital sandbox for manufacturing
(Digital Twin Factory)

Using sensor data and AI to create and analyze digital models of real-world machines and factories—enabling operations to be improved without disrupting production.

Trying to optimize a manufacturing operation without disrupting production can be like trying to change the tires on a race car while it's zooming around the track at 200 miles per hour. The solution? An AI-enabled "digital twin." A digital twin is a virtual representation of a physical device or system that mirrors its exact elements and behavior in real time. Sensor data from numerous sources—along with historical data—is combined with machine learning and advanced analytics to create digital models and spatial graphs that constantly match the status, position, and working condition of their physical counterparts. These exact digital simulations enable a company to conduct extensive analysis and optimization experiments without disrupting day-to-day operations. It's a virtual process that can deliver real-world benefits.

Avoiding industrial disasters

(Virtual Plant Operator Assistant)

Using AI to help plant operators perform their jobs more effectively with less risk of catastrophic errors.

Traditional plant control systems rely heavily on monitoring from human operators. However, much of the time those operators are sitting around the control room with little or nothing to do, making it easy for them to lose focus or have their skills deteriorate. AI can supplement operators' capabilities, helping them make better decisions and avoid human error—especially in critical situations where stress levels might be off the chart and every second counts. In concept, this is similar to vehicle-related AI capabilities such as autonomous driving and lane assist that are designed to help people function more safely and effectively, but applied to complex industrial activities that are much less common have greater potential for serious consequences (such as a chemical explosion or nuclear meltdown). In critical situations like these, operators would need all the help they can get—particularly from AI, which is immune to pressure and stress

The Financial Services AI Dossier

Aside from numerous FinTechs that are fully embracing AI, most firms in the financial services industry (FSI) are still in the very early stages of AI adoption and investment. Although FSI leaders generally recognize and acknowledge the potential impact of AI on their businesses—and that AI is an inevitable part of the industry's future while being the primary fuel for future growth and competitiveness—most AI investments and efforts to date have been limited to small-scale pilots and niche use cases focused on narrow parts of the business.

01
02
03
04
05
06
07
08

For most FSI firms, the important next step is to stop dabbling with AI and start embracing and industrializing it so that AI solutions can be deployed on a large scale across the entire enterprise. This would likely require core building blocks such as enterprise-wide data governance and clear strategies for harnessing the power of AI and data. Simply throwing more money at the problem won't be enough.

One focus area that continues to get a lot of attention in FSI is using AI to improve the customer experience—not only for a firm's end customers, but also for its internal customers such as agents, brokers, and financial advisors. For example, AI is helping make chatbots and IVR systems far more intelligent and sophisticated than before, improving the quality of automated customer interactions and seamlessly integrating and orchestrating multiple interaction channels. Similarly, predictive AI is being used to engage with customers more thoroughly and effectively throughout their entire lifecycle from personalizing marketing campaigns and promotions, to recommending individualized next best actions, and plans.

Another rapidly emerging usage area for AI is automating and enhancing critical FSI processes such as fraud detection, payment processing, cash reconciliation, underwriting, and claims management. Some of these processes are highly repetitive and labor-intensive, making them prime candidates for automation. Others can greatly benefit from improved insights and have been using targeted analytics for decades with AI lifting those analytics capabilities and insights to a whole new level.

Industry convergence is another key trend being driven by AI—and it's not just limited to FinTechs. AI technologies, fueled by the explosion of digital data, are enabling entirely new products, services, and business models that blur traditional industry lines. And the speed, scale, and scope of this industry convergence seems to only be increasing.

Thinking longer term, an important trend that is almost certain to take root in FSI is using AI and digital data to break down functional silos and generate insights that span the entire value chain. (For example, using data from an insurance chatbot to inform the underwriting process). However, capitalizing on broad, large-scale AI use cases and opportunities would require enterprise-level AI building blocks and industrialization capabilities noted earlier, which are still being developed.

AI is helping make chatbots and IVR systems far more intelligent and sophisticated than before, improving the quality of automated customer interactions and seamlessly integrating and orchestrating multiple interaction channels.

Fighting fraud
(Banking Fraud Analytics)

Use AI and machine learning to detect transactional and account takeover fraud across the banking value chains.

Issue/Opportunity
According to the American Bankers Association, the finance industry incurred about $2.2 billion in fraud losses in 2016, rising to about $2.8 billion in 2018. Banks need the ability to predict and detect fraud more quickly and accurately in order to reduce their annual fraud losses and better manage the fraud resolution customer experience—improving trust and compliance with their customers and partners.

How AI can help

Detect fraud in real time
Banks have deployed machine learning models that can detect suspicious transactions in real time and immediately alert authorities.

Spot suspicious activity that humans might miss
Banks can use AI models to quickly and accurately identify suspicious patterns in large datasets that a human would likely miss. This would allow banks to analyze suspicious transactions and transfers that could indicate an account is being used to conceal and legitimize funds from criminal activities. Also, AI can help reduce the number of false positives, thereby reducing compliance costs.

Flag consumer transaction fraud
Machine learning models can predict potential fraud in future transactions by studying historical transaction patterns in traditional and non-traditional data, and then using anomaly detection to spot unusual account activities. This allows banks to uncover problems that could be overlooked by their legacy fraud analytics engines.

01
02
03
04
05
06
07
08

47

Fighting fraud
Managing risk and promoting trust

Secure
When using AI to outwit criminals, the AI itself can become an attractive target for compromise. Think critically to determine how a model is made secure. Is the underlying data secure? How widely known is the model, and who could have access to it? Could a bad actor exploit system errors or even reverse engineer the code to commit fraud without detection?

Robust
Criminals seek new ways to commit fraud surreptitiously, which includes finding new ways to deceive systems and people. While AI can reveal suspicious activity by identifying anomalies in the data, it might also deliver suboptimal outputs because the nature of the fraud is new and unfamiliar. AI used to detect fraud needs to be robust to perform accurately in the face of novel data.

Reliable
While the value of AI in this use case is in detecting fraud, consider the risk to the customer relationship if the system outputs false positives. If a customer's banking is interrupted or if they are notified of potential fraud that did not occur, it could irritate or even scare the customer, creating brand and reputation risk.

Privacy
In cases of high uncertainty, such as fraud detection, novel data can be critical for recalibrating and re-training the AI to better identify fraudulent activity. The few known fraud cases can be particularly valuable. Confirm whether the data is subject to privacy rules and data protection regulations in terms of how fraud cases and descriptive meta data are stored and transferred.

Possible benefits

Reduced fraud and improved trust
Banks can use AI-enabled detection models to significantly reduce overall fraud, thereby improving customer trust and the overall customer experience.

Less manual auditing and lower fraud detection costs
AI-enabled fraud detection models can decrease the need for manual auditing, thereby potentially reducing the overall cost of a bank's fraud detection operations.

48

Chatbots that do more than chat
(Conversational AI)

Use conversational AI solutions such as chatbots and virtual assistants to handle a wide range of consumer-facing activities— from helping consumers find a better credit card or cancel unneeded accounts, to negotiating collections.

Issue/Opportunity

In recent years, consumer demand for the ability to manage finances remotely has grown significantly, overwhelming customer service call centers and agents. Banks can relieve the pressure by using conversational AI to provide personalized financial plans, enhance customer relationships, and even automate debt collection activities.

How AI can help

Advise customers without human intervention
Robo-advisors can use data analysis and regression models to analyze a customer's current financial situation, goals, and investment interests and then provide tailored financial recommendations (such as tax-loss harvesting, goal planning, retirement planning, and automatic asset investment) over the phone or through a chatbot, without the need for input from a human advisor.

Automate debt collection
Many of the mundane monitoring and administrative tasks related to collections can be automated using AI-enabled RPA technologies. These AI technologies can send out automated reminders to customers, track effectiveness, and recommend next steps to the collections team with minimal human input and oversight.

Serve customers through chatbots and other natural language applications
Natural language processing (NLP) models can be used to develop chatbots and other customer service applications that learn a customer's typical spending behavior, provide tailored offerings, and give banks a better overall view of their customers. The AI systems can then recommend the most relevant credit cards and checking accounts, and even alert customers about unneeded accounts.

01 02 03 **04** 05 06 07 08

49

Chatbots that do more than chat
Managing risk and promoting trust

Fair and impartial
With personalized advice, AI needs to be equally accurate and valuable for all customers or an organization risks providing unequal service. Advice is based on data like salary, spending, and contributions while fair AI provides commensurate accuracy to end users across all levels of financial activity, geographies, age, and other personal characteristics.

Transparent
Customers seeking advice or opportunities may know they are engaging with AI, but they may not understand the degree to which the AI is operating independently of human advisors. Weigh the risks that may result from a fuller user awareness of AI independence, including whether that knowledge could negatively impact customer confidence in the advice—and if so, how to mitigate it.

Accountable
Even when monitoring and administrative tasks can be automated, humans remain accountable for outcomes. Has this accountability been embedded in process and communicated to the workforce? What are the rules concerning, for example, debt collection notices sent to the wrong customer who then mistakenly pays the debt? Who manages the AI to avoid that circumstance?

Secure
Implementing an AI-driven chatbot leads to integration with other IT systems. Using IT security frameworks can help mitigate the risk of cyber attacks. Additionally, because chatbots communicate with customers directly, look for amendments to processes and supplementary tools to help ensure access management of client data is not undermined by the IT integration.

Possible benefits

Improved efficiency and service quality
AI can provide clients with personalized financial investment plans, products tailored to their unique needs and goals, and can be done more accurately and efficiently than a human advisor.

50

Hyper-personalization
(360° Customer Experience)

Use AI to acquire customers and deliver an ultra-personalized, end-to-end customer experience supported by deep AI-driven insights, including; customer churn prediction/prevention, estimated customer lifetime value (CLV), marketing optimization, customer segmentation and personalization, and next best action.

Issue/Opportunity

AI technologies can help traditional banks and insurance companies acquire customers, grow revenue, and maintain customer loyalty by giving an organization the ability to better understand its customers (their evolving expectations) and then deliver a hyper-personalized customer experience.

In banking, for example, the traditional mass campaign model for acquiring customers is being disrupted by an AI-driven approach that focuses on "buying moments"—enabling banks to offer the right product at the right time to the right client. This approach targets carefully selected acquisition pools, micro geographies, and customer segments based on life stage, banking wallet, and short- and long-term value potential.

These kinds of capabilities, which are already foundational in other industries, are poised to fuel financial services in the near future.

How AI can help

Better understand customer needs and expectations
With AI, banks and insurance companies have the power to understand customer expectations at every step of the customer experience.

Predict customer churn
Machine learning models can estimate customer lifetime value (CLV) and predict customers' propensity to churn based on their profile and transaction data.

Improve customer segmentation and personalization
AI and machine learning models can increase the accuracy and granularity of customer segmentation and personalization by deeply analyzing historical and real-time data.

Determine the next best action
Machine learning models can be used to predict a customer's propensity to accept additional offers based on past behavior.

01
02
03
04
05
06
07
08

51

Hyper-personalization
Managing risk and promoting trust

Fair and impartial
Using AI to narrowly target individuals for sales raises, strategic, ethical, and even legal questions about the impartiality of the data used with the fair and equal presentation of offers and prices. Bias lurking in training and testing data can yield biased outputs without any ill-intent on the part of organization. Nevertheless, when dealing with sensitive personal information, consider the steps the organization can and should take to manage and validate fairness.

Privacy
Customers may be unaware of how much data the organization holds about them and how that data is used to train AI. Consider any brand or legal risks that could arise by virtue of collecting and storing sensitive information. What obligations does the organization have regarding certain data, such as personally identifiable information? Where is the ethical line on privacy in micro-targeted "buying moments," who draws it, and who enforces it?

Security
Data used to fuel hyper-personalization often includes personally identifiable information. Look at how processes, stakeholders, and supplementary tools can ensure that protected data is not divulged (either accidentally or due to a malicious attack) when the tool is deployed. Privacy regulations and laws vary across geographies. Organizations should consult their legal and compliance professionals for guidance in developing the governance processes that can meet data privacy expectations.

Possible benefits

Expanded customer acquisition and revenue opportunities
Through an AI-driven 360° customer experience, banks and insurance companies can expand their revenue opportunities by acquiring new customers and recommending products tailored to a customer's unique needs.

Optimized investment decisions
Building large customer datasets and then using advanced AI and machine learning tools to provide custom designed-products and services enables investment decisions to be optimized and integrated across products, channels, etc.

Underwriting that goes over and above
(Insurance Underwriting)

Use AI and machine learning to help enhance underwriting processes and risk evaluation, aid in decreasing decision times, and possibly improve the customer experience and bind rates.

Issue/Opportunity

Despite substantial investments over the past several years to digitize customer onboarding and policy binding, progress has been slow and incremental with many insurance companies failing to meaningfully scale their efforts to modernize underwriting.

How AI can help

Automate the underwriting process
Text mining and natural language processing can be used to enable automated underwriting platforms that eliminate the need for human touch, drastically reducing the time required to process applications.

Make applying for insurance simpler and more user-friendly
Machine learning models have shown that insurers can accurately assess risk with less information. This creates an opportunity to simplify insurance applications and remove invasive tests and questions, making the entire process much more user-friendly.

Simplify risk assessment
Using machine learning, insurers can now identify different categories of risk, each with its own set of risk factors. This simplified risk assessment process allows companies to speed up deployment of their AI models.

01
02
03
04
05
06
07
08

53

Underwriting that goes over and above
Managing risk and promoting trust

Explainable
There is regulatory scrutiny around underwriting practices, and insurers need to be able to explain to regulators how they know their models are operating as intended. Consider which stakeholders are concerned with how applications are processed and how risk is evaluated, as well as how the need for AI explainability might differ between stakeholders.

Accountable
Human employees are accountable for the AI assessing risk and processing applications, and for employees to meet their accountability, they need to understand what that means in the context of their role. Define, document, and communicate accountability as it relates to a stakeholder's role in the AI lifecycle.

Robust and reliable
Consistent outputs can directly relate to the bottom line. An inaccurate and unreliable model could lead underwriters to incorrectly price policies, miss, or overextend policies. The result may be lost revenue. Test and validate that the model remains accurate in the face of unexpected data, and manage for reliable outputs over time.

Possible benefits

Accelerated process improvement
Through AI, insurance companies can accelerate the development and deployment of product purchasing journeys that are data-augmented and digitally enabled.

Reduced costs and higher margins
AI can be used to automate the underwriting process and streamline the manual touchpoint of surveys and questionnaires. This can reduce underwriting costs and drive higher margins that can be used to grow and expand the business.
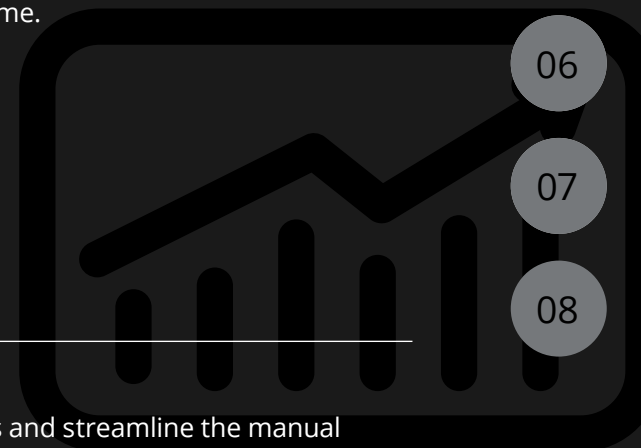
Trade operations made easy
(Trade Operations Automation)

Use AI and machine learning to help automate tasks such as trade reconciliation and operational exceptions remediation.

Issue/Opportunity

Many financial firms are currently facing exponential growth in both the number and complexity of traded products. This is straining the reconciliation process, which has traditionally required manually integrating information from a multitude of internal and external systems. Using machine learning to automate many of the maintenance tasks associated with trade operations can increase both accuracy and efficiency.

How AI can help

Quickly implement trade reconciliation tools using cloud-based AI
Through a cloud interface, firms can implement trade reconciliation tools in less than a day at extremely low cost, quickly producing a positive ROI. Many cloud-based solutions have embedded AI capabilities that can expedite reconciliation activities.

Automate the process of capturing information from invoices
AI models can use computer vision and natural language processing to understand the structure of an invoice and then use that knowledge to extract key information such as the seller's name, institution address, and amount due. Also, AI models can take human feedback into account for future invoices, dramatically accelerating the reconciliation process.

Reduce human error and time to close
Manual rules-based matching/reconciliation can take days to close each month and is highly susceptible to human error. Automating the process with RPA reduces the time required to close and minimizes the risk of human error.

01
02
03
04
05
06
07
08

55

Trade operations made easy
Managing risk and promoting trust

Security

Automated reconciliation tasks may be attractive targets for criminals. If a fraudster can decipher how the AI functions, they can tailor attacks to avoid detection or exploit a vulnerability in the system. Could fraudulent invoices be categorized as legitimate? What does faster reconciliation mean for security and the integrity of trade operations? Important stakeholders can include the chief security officer, cybersecurity professionals, and dedicated AI managers.

Robust and reliable

When using automation for reconciliation tasks, inaccuracies can require significantly more corrective action. If human employees make errors, they need retraining and support. With AI, a transaction may have been processed incorrectly, requiring significant human labor to check and correct reconciliation tasks. The AI model's reliability over time and its capacity to accurately respond to novel data is vital to realizing value.
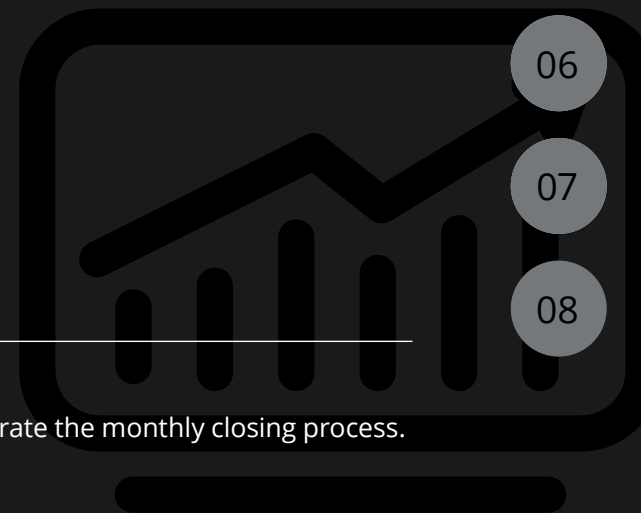
Possible benefits

Lower costs
AI can reduce the time and labor required to reconcile transactions.

Faster close with fewer errors
By reducing errors due to human input, AI can accelerate the monthly closing process.

Payment with a smile
(Biometric Digital Payments)

Using facial recognition and other AI-based biometric technologies to process payments.

The holy grail for digital payments is to find a mechanism that is both highly convenient and highly secure. Machine learning and deep learning enables sophisticated forms of identity authentication based on biometrics such as face recognition, speech recognition, fingerprint recognition, and retina recognition. Some businesses in China are using a smile-to-pay system that allows consumers to authorize payments simply by smiling into a camera[8]—and adoption of similar systems in other countries is in the not-too-distant future. AI-powered biometrics can also play a key role in two- or three-factor authentication systems, which are far more secure than passwords alone. After all, what could be more uniquely you than security characteristics directly tied to your personal genetics and DNA?

Insurance that adapts to you
(Usage-based Insurance)

Using AI to adjust insurance coverage and rates on-the-fly based on a customer's actual behavior and needs.

Perhaps the biggest limitation of traditional insurance underwriting methods is that they rely on actuarial calculations and statistics associated with groups of people with similar attributes, rather than basing rates and coverage on the actual behaviors and attributes of the person being insured. However, thanks to AI, that could all change. Usage-based insurance (UBI) is already common for auto insurance, leveraging in-vehicle telematics and smartphone apps to track a variety of critical driving habits—such as acceleration, braking, cornering, miles driven, and phone use which would raise and lower the the driver's insurance premiums accordingly. But in the future, UBI models will likely expand into many new areas, including everything from airline flights and commercial trucking (with varying rates for different weather conditions and load types) to washers, dryers, and phone batteries (with rates based on an individual's unique usage patterns). This would enable insurance customers to buy the exact insurance they need—and pay exactly the right price. Aside from the technical barriers, which are rapidly being tackled, regulatory constraints could also slow the pace of UBI adoption and innovation, particularly for personal lines and individual coverages.

01
02
03
04
05
06
07
08

Stopping criminals in their tracks
(Consumer Fraud Detection)

Using AI to predict, prevent, and detect insurance fraud and questionable financial transactions.

Fraud has been a major concern for the financial services industry since its inception; however, the explosion of digital technologies and data in recent years has only made things worse. Now, machine learning and other AI technologies are poised to reverse the trend—guarding against fraudulent payments, reducing the risk of fraud and abuse of customers' accounts, and identifying insurance customers who are abusing their policies. Also, AI algorithms can automatically identify and analyze risk factors for individuals and organizations continuously scanning for clues across numerous data sources—including social media and deep web forums—to address potential fraud before it occurs. With AI, financial services firms finally have a chance to get in front of criminal behavior, instead of being a step behind.

01
02
03
04
05
06
07
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Making credit risk less risky

(Credit Risk Analytics)

Using AI to assess risk and creditworthiness for loans and credit cards. Success in the lending business largely hinges on making smart choices and trade-offs about credit risk.

AI can help lenders, borrowers, and credit card companies make more informed choices. Machine learning and other AI technologies can automatically assess a borrower's creditworthiness—even for non-prime and unbanked borrowers—and can support the loan management process across its entire lifecycle, including automated documentation and compliance validation. At the same time, AI can enable app-based online platforms for residential and commercial mortgage loans using advanced algorithms to analyze a borrower's financial information and then recommend loan options from multiple lenders. In some cases, it can be as easy as having borrowers scan their driver's licenses and answer a few basic questions. Advanced capabilities like these are a win-win for borrowers and lenders alike, enabling smarter choices with less effort and risk.

Not just location, location, location

(Real Estate Price Estimation and Prediction)

Using AI to estimate real estate values by analyzing a wide range of variables—including new types of data, such as geographic images from drones.

When it comes to valuing real estate, the classic quip is that the three biggest factors are location, location, location. And while there's a lot of truth to that statement, in reality there are many complex variables that go into estimating property values and predicting price trends—making AI the perfect tool for the job. For example, emerging AI systems are enabling sophisticated valuation models for properties and neighborhoods using computer vision and other advanced technologies to analyze geographic images from drones. New AI-powered capabilities like these can enable real estate investors to assess opportunities much more accurately, boosting their return on investment.

01
02
03
04
05
06
07
08

The Government & Public Services AI Dossier

In the government & public services (GPS), AI adoption and maturity levels tend to vary depending on the government agencies, their existing infrastructure's reliance on legacy systems, and workforce fluency.

Defense, intelligence, and law enforcement agencies are commonly deploying and scaling AI, actively embracing advanced technologies such as computer vision, leveraging graph analysis, using deep neural networks to uncover suspicious activities and actors in large data sets, streamlining functions and supporting the warfighter in mission applications and weapons systems, and monitoring and improving readiness of personnel and equipment.

Civil and health agencies are leveraging AI across the AI spectrum—from early stages of conducting assessments to evaluating the organization's readiness for AI and identifying where it could bring the greatest return on investment, to operationalizing and deploying AI for a wide range of critical use cases such as climate and economic analysis, trade surveillance, research, and fraud detection. Health agencies are leveraging AI to expedite the process for drug trials, drug discovery, and analysis of health records and medical data (including complex imaging data from microscopes, MRIs, and x-rays). This has led to a spur of greenfield and brownfield projects in genomic and personalized medicine.

Several state governments have begun adopting AI/ML capabilities to improve and support the services they provide to their citizens, including areas such as public transit, modernizing DMV capabilities, and helping make intelligence decisions for enrollment analytics.

Looking across the public sector, a common trend emerges from the growing use of robotic process automation (RPA) to automate back-office activities such as finance and HR. This better enables government employees while reducing or eliminating their time focused on manual activities that are repetitive and time-consuming.

01
02
03
04
05
06
07
08

Compared to private sector organizations, government agencies face additional legal and risk constraints which can inhibit their ability to quickly adopt and deploy AI. Given their responsibility to support the public in an equitable manner, public sector organizations tend to face high standards when responding to fundamental AI issues such as trust, safety, morality, and fairness. In the face of these challenges, many government agencies are making a strong effort to harness the power of AI while cautiously navigating through this maze of legal and ethical considerations. Lastly, government budgets fund specific programs and activities—not necessarily the underlying technologies that enable them—meaning AI

investment generally plays a supporting role in public sector plans and strategies, rather than on the converging and enabling collection of the technologies themselves.

Nonetheless, there appears to be growing support, recognition, and action within the executive and legislative branches in the United States government as to the role AI will play in our nation's overall competitiveness. This recognition and shift in mindset will have a trickle-down effect on AI adoption and maturity throughout the public sector.

Compared to private sector organizations, government agencies face additional legal and risk constraints which can inhibit their ability to quickly adopt and deploy AI.

01

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04

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Pushing back on paper pushing
(Claims Processing Back Office Automation)

Use robotic process automation (RPA), natural language processing (NLP), and computer vision to digitize paper documents and accelerate processing.

Issue/Opportunity

Most government agencies spend countless hours processing paper documents and manually entering data into back-office systems and databases. For example, processing claims and applications for assistance from the Department of Social Services (DSS) and other agencies requires laboriously reviewing 70,000+ applications per month.

Many back-office functions rely on paper documents that must be manually digitized downstream in preparation for processing. A lack of intelligent online intake systems can create efficiency bottlenecks.

Intelligent IT systems have the potential to increase analytics capabilities and simplify audit and historical document tracing efforts. Today, implementing a combination of computer vision, NLP, and RPA is becoming the norm—enabling end-to-end back-office automation, from service intake to feedback.

How AI can help

Enable intelligent portals
AI-powered online self-service portals can increase data intake capacity and reduce reliance on brick-and-mortar government centers.

Capture and prepare data
Widespread digitization using computer vision to digitize paper documents—as well as NLP to enable smart searches on digitally submitted forms and applications—can improve speed and reduce the need for manual data entry.

Process data more efficiently
In many cases, RPA systems—combined with machine learning—can learn how to assess applications, understand the potential actions given certain criteria, and completely automate the review process—eliminating many overhead costs.

Drive continuous improvement
Intelligent automation can improve public service outcomes by displaying case status, e-notices, and account balances (where applicable). These advanced systems incorporate feedback loops to gauge service levels and continually improve performance at procedural pain points.

01 02 03 **04** 05 06 07 08

65

Pushing back on paper pushing
Managing risk and promoting trust

Security

Government agencies work with a variety of sensitive information. During training and testing (or during an acquisition from a third party), develop the model and the supporting technology infrastructure in a way that it can withstand known and potential security compromises. Such precautionary steps may be mandated by the policies of the agency or laws governing its operation.

Privacy

The treatment of personal information may be governed by laws or regulations on individual privacy. Do the models deployed for back-office functions align with applicable rules? Where is the processed data stored, how is it transferred, and how is it deleted, if at all? Post hoc solutions to privacy issues resulting from AI use may be insufficient for those with government oversight responsibilities.

Possible benefits

Do more with less

Back-office automation should be considered an essential enabling technology for government agencies facing constant pressure to provide higher levels of service to more people with fewer human capital resources.

Getting in front of social problems
(Population Risk Support)

Use AI and human-machine teaming to better predict risk for housing and food insecurity, addictions, and mental health episodes—enhancing public policy to improve citizens' quality of life.

Issue/Opportunity

Homelessness, drug abuse, and mental health deterioration are widespread problems across the US, with those issues often compounding each other to degrade quality of life and increase the need for government assistance. Historically, legislators responsible for making social policy focused on relief efforts that address problems after they occur, with prevention taking a back seat. However, thanks to the advent of predictive modelling, policymakers are increasingly adopting a data-driven approach to help them better understand risk factors and adjust social policy accordingly.

How AI can help

Identify risk factors
Leveraging public health records and independent study data, AI can identify trends and pick out key environmental, psychological, and behavioral factors that lead to homelessness, drug abuse, and other health-related social issues.

Predict risks
Machine learning algorithms can screen localized populations using identified risk factors and local environmental conditions (such as housing and food security, addiction, and mental health) to predict how the factors might compound to affect risk.

Enable human-machine teaming
Policymakers can use the outputs of predictive models to determine the likely efficacy of proposed programs and then shape their policy goals for specific outcomes, such as lowering drug addiction within a specific community and reducing the likelihood of food security in underserved communities.

01
02
03
04
05
06
07
08

67

Getting in front of social problems
Managing risk and promoting trust

Fair and impartial
When using AI to identify needs and risks to inform social policy, consider whether the model or underlying data contains bias or missing data points that could lead to unfair outputs. If the data is biased toward a geographic area or demographic, the model's outputs could inject inequality into policymaking, even if there is no ill intent or bias on the part of human stakeholders.

Transparent and explainable
Government transparency can be a particular concern for constituents and oversight bodies. This call for transparency and explainability extends into the use of AI, including how it was developed, how much it cost, how it works, its intended outputs, and the people accountable for its function. Documenting and communicating these and other issues around the AI application moves toward transparency and explainability in AI and governance.

Possible benefits

Improved understanding of health determinants
Trend analysis of population risk factors alongside local policies and programs can provide insight into which social and environmental factors are the most telling determinants of health.

Better prediction of proposed policy impacts
Machine learning can leverage health data and known local risk factors to predict the impact of proposed policies and inform targeted legislation to achieve specific population health goals.

01
02
03
04
05
06
07
08

Medical breakthroughs at record speed
(Biomedical Data Science)

Use AI algorithms to analyze large quantities of biomedical data—including genomic, imaging, and clinical data— to accelerate discovery of new ways to prevent, diagnose, and treat diseases.

Issue/Opportunity

Medical research and discovery has long been a time and capital-intensive endeavor, with new research projects requiring significant vetting and funding before getting the go-ahead to ensure resources are not wasted. Research projects typically generate large, complex data sets that may be difficult or near impossible for humans to fully interpret. However, with advances in AI technology and rapidly growing stores of biomedical data, AI-powered systems are now capable of conducting automated discovery research to help drive scientific discovery and identify new medical trends and solutions.

How AI can help

Interact with researchers in their natural language
Stores of biomedical data are compiled into a database that researchers can query in plain language to obtain updated medical statistics, new research outcomes, and answers to diverse bioinformatics questions.

Analyze a broad range of biomedical data
AI can help analyze biomedical imaging, genomics, and clinical data—along with data from wearable and implantable devices—to accelerate detection, prevention, and treatment of diseases.

Improve drug discovery
Machine learning models can predict how molecular compounds might interact, helping to identify targets for drug discovery and flag promising findings for further investigative research.

01
02
03
04
05
06
07
08

Medical breakthroughs at record speed
Managing risk and promoting trust

Fair and impartial
Medical data can contain latent biases for a variety of reasons, which could potentially limit medical insights or miss important discoveries altogether. If the underlying training and testing data favors some patient characteristics and under- or misrepresents other characteristics, the result can be algorithmic bias. This can have profound implications for the resulting decisions on medical research and analysis.

Privacy
Laws, regulations, and industry standards influence how biomedical data should be stored, transferred, used, and shared. Consider where biomedical data originated and whether it must be treated, augmented, or protected to promote personal privacy during model training and testing. From an ethical perspective, this is particularly important in instances where the sources of the data have no meaningful control over how it is used.

Robust and reliable
There is a trade-off between model explainability and model accuracy, with the latter being vital for healthcare use cases. Given this, when designing and deploying tools to analyze vast amounts of information, users need confidence that even if they cannot explain precisely how the model reached its conclusion, they are nevertheless confident in its reliability.

Possible benefits

Easier access to complex data
Natural language processing is making complex biomedical data more accessible to medical professionals, enabling greater utilization of the ongoing research and data being collected.

Discovery of new disease trends and drugs
Machine learning algorithms are gleaning insights from vast data sets to discover new disease trends and drugs—improving diagnostic and treatment capabilities.

01
02
03
04
05
06
07
08

Making sense of HR benefits
(Benefits Administration)

Use AI to optimize service recommendations and enhance customer engagement, improving both the speed and quality of service delivery while transforming the employee work experience and reducing workloads.

Issue/Opportunity

AI plays a large role in how people now interact with many consumer products and brands. However, it has not affected HR activities to the same extent. In particular, continued lack of individualized guidance about sponsored benefits—as well as issues with program delivery quality—are having a detrimental impact on employee engagement and employer decision-making about benefit programs.

How AI can help

Understand how employees currently engage with HR
AI can be used to detect engagement trends across programs to gain insights about which programs are preferred by specific employee segments and to gauge each group's satisfaction with their chosen programs.

Optimize benefit offerings
Using predictive modeling, HR departments can understand the financial impact of adding specific programs and then benchmark against the expected net advantage to employees most expected to enroll. This can provide employees personalized and refined options when selecting programs that will best benefit them.

Enhance service delivery
Intelligent benefits "mentoring" systems use data about employee claims history and coverage requirements to provide a range of recommended programs (with estimates of total cash outlay for each plan). Personalized recommendations can be presented in a web portal that includes informative materials to help educate employees about the recommendations and why they might choose to enroll. These tailored solutions and recommendations can help improve employee fluency with benefits programs and packages, helping ensure that employees are prioritizing the right investments and activities to achieve their goals.

01
02
03
04
05
06
07
08

Making sense of HR benefits
Managing risk and promoting trust

Fair and impartial

If the training and testing data is not representative of the workforce's full diversity, there is a risk that the AI outputs may fall short of delivering the intended value and limit ROI. Personal qualities (e.g., age) can be underrepresented in the data, and the resulting recommendations may be undesirable or a poor fit with employee needs. Interrogating the data for bias can lead to a more representative dataset that in turn fuels more appropriate recommendations.

Transparent

Engendering employee engagement with the AI offering can help increase adoption and trust, and employees may benefit from an understanding of how the employer determined which programs to offer. That is, noting that AI was used to better understand trends and needs may instill greater confidence, interest, and use of new programs. Conversely, obscuring or failing to mention the role of AI could be a missed opportunity for progress with HR benefits.

Secure

The data used to fuel AI for recommendations and engagement contains a range of personal information that is not only sensitive but whose protection may be mandated by laws or regulations. Failing to guard protected data could lead to regulatory penalties and even litigation. Explore methods for data access management throughout the AI lifecycle, including the transfer and storage of employee interactions with the AI.

Possible benefits

Smarter benefit investments
By gaining deeper insight into how employees engage with benefits programs, employers can make more informed benefit investment decisions that optimize employee satisfaction and total benefits spend efficiency.

Increased program engagement
Intelligent personalized recommendation engines can bridge the gap between optimized offerings and broad employee awareness and education, leading to higher program engagement from employees.

Tackling problems before they become crises
(Health and Environmental Predictions)

Use AI to identify patterns, impacts, and mitigation options for challenges related to public health and climate change.

Issue/Opportunity

Epidemics and pandemics have challenged populations throughout history by spreading faster than governments and health entities can research and formulate tactics for prevention. COVID-19 has reignited an urgency for the public sector to combat disease outbreaks and other health crises through a data-driven approach. Compounding the challenge is the issue of climate change, which exacerbates health inequities and poses broad risks to social well-being and the global economy.

How AI can help

Disease outbreak prediction
Modern health information extends beyond what has traditionally been measured, now including economic, social, cyberspace, and IoT data. Deep-learning neural networks can use this wealth of new and traditional data to assess the risk of an epidemic, predict the trend of an ongoing epidemic, detect abnormal changes, and issue early warnings as needed. For example, COVID spikes could be detected within a specific geography by monitoring sewage data.

AI-informed public intervention
Machine-learning algorithms can identify at-risk populations and consider subtle factors (such as human behavior, disease transmission patterns, and natural and man-made environmental factors) to calculate the optimal sensing and screening strategies—and to create public health communications that can have the broadest possible impact. In addition, AI can be used for longitudinal forecasting of co-factor and long-term health effects (e.g., co-morbidity and chronic condition modeling). Also, in the event of future pandemics, AI can help improve the resilience of global supply chains, workforces, and intervention channels.

Health crisis investigation and AI-assisted drug development
During an epidemic, AI can analyze incoming data to identify the source of the outbreak and inform the discovery process with additional data-driven trends and insights. It can also accelerate vaccine development and improve diagnostics.

Environmental modeling and monitoring
AI can model changing global weather patterns using predictive analytics and agent-based simulation models to enable more accurate tracking and forecasting of extreme climate events and inflection points. Using computer vision and machine learning, AI can also analyze satellite images and draw insights about trends in biodiversity, wildlife health and activity, and environmental changes such as erosion and water loss—as well as track methane and other greenhouse gas emissions. In addition, advanced machine learning models can accurately estimate carbon emissions across international supply chains. These insights are important for climate impact assessment, abatement portfolio management, simulation of decarbonization scenarios, physical risk assessments, analysis of abatement impacts, monitoring the effectiveness of carbon offsetting efforts, and tracking and taxing emissions.

01
02
03
04
05
06
07
08

73

Tackling problems before they become crises
Managing risk and promoting trust

Fair and impartial
Disease detection should be accurate for all communities and individuals, equally. If data collection and curation are biased (e.g., self-reporting symptoms is more likely from one group over another), AI outputs will reflect that bias. Look across the AI lifecycle for opportunities to mitigate bias, particularly in terms of how datasets are created and curated.

Privacy
There are rules and laws that dictate how personal health information is collected and used. When using AI to probe public health data or develop medical treatments, privacy can be bolstered with tactics for obscuring protected information, such as by using anonymized or synthetic training and testing data. Legal and compliance professionals can also contribute to strategies for ensuring data processes meet relevant laws and regulations.

Robust and reliable
In a fast-changing data environment, AI models may often encounter new and unexpected data, which presents the potential risk of model drift. Does the model retain accuracy despite novel inputs? Does it remain accurate over time? If not, it could lead a model to return an inaccurate assessment or correlation, leading to outputs that disagree with the real-world health conditions.

Possible benefits

Effective disease intervention in record time
AI can be a powerful tool for combating public health crises—helping to curtail epidemics faster than previously thought possible by enabling: a data-driven approach to risk assessment; academic exploration to build essential knowledge; and accelerated development of intervention strategies and solutions. Also, novel AI technology can improve sequencing and sensing techniques, potentially catalyzing the development of effective epidemiologic and risk models, as well as interventions such as therapeutics and vaccinations.

Deeper understanding of climate change causes and impacts
Predictive analytics, computer vision, machine learning, and simulation models are helping monitor and predict climate change's impact on weather patterns, environmental health, and human emissions. This data-driven approach to monitoring emissions and the climate can be a critical enabler for global efforts to mitigate and adapt to climate change—and to create more resilient health systems.

74

Spotting trouble before it occurs

(Video Surveillance Predictions)

Using AI and computer vision-enabled video surveillance to detect potential security threats more quickly and accurately.

Video surveillance is an essential tool for maintaining law and order but has traditionally required constant monitoring by humans. Now, however, AI is increasingly becoming a core enabler for video analytics. Deep learning, computer vision, and object/face recognition are enabling unprecedented levels of speed and accuracy—making it possible for systems to conduct automated monitoring and analysis, and then trigger corrective actions in real time. Also, deep learning is enabling multiple systems to communicate and coordinate with each other, processing and analyzing multiple video and data streams at the same time. In prisons, these AI-driven video surveillance solutions could detect weapons and analyze activities for potential threats, issuing alerts and highlighting possible problems on the screen so security personnel can quickly pinpoint and address them.

01
02
03
04
05
06
07
08

The art of war in the AI era

(Agent-based simulations to refine military strategy)

Using deep learning to simulate tactical moves and refine military strategy in real time.

Although the fundamental principles of military strategy and tactics have been around for thousands of years, that doesn't mean the art and science of war are stagnant. On the contrary, emerging AI systems are proving useful for simulating human decision-making and predicting the actions of complex systems in which millions of individual "agents" (whether humans, economies, transactions, cars, or viruses) all behave in their own unique ways. With AI techniques such as deep learning and reinforcement learning, the interactions and behaviors of all those individual agents can be simulated and modeled with unprecedented accuracy. This new capability could give military leaders a powerful new weapon for refining their strategies and simulating tactical moves in real time.

01
02
03
04
05
06
07
08

City of the future
(Civil Asset and Infrastructure Management)

Using AI to monitor and maintain a city's physical assets and infrastructure, ensuring they are fully functional and operating safely.

Managing all the physical assets and infrastructure necessary to keep a city running smoothly is a massive undertaking. AI and machine learning—in conjunction with sensor networks and camera feeds—can make the job a lot easier, helping to monitor and maintain everything from parking meters, fire hydrants, and emergency call boxes to street lights, bridges, and road signs. In addition, sensors and AI can be used to monitor actual usage levels, enabling cities to conduct use-based maintenance, which can be far more efficient and effective than time-based maintenance. The result? Cities that can operate more smoothly and safely while getting the most value from every taxpayer dollar.

Augmenting and assisting the judgement of our judges
(DS&J: Legal Outcome Predictions)

Using machine learning and deep learning to analyze decades of case law—and millions of past cases –to predict outcomes for future cases and accelerate case resolutions in both domestic and international courts.

One of the hallmarks of human intelligence is judgment—and no aspect of our society poses a greater test of intelligence and judgment than the legal system. While machine learning and other AI technologies operating today are moderately in their infancy state, they are making tremendous strides at leveraging past decisions and case law to predict future case decisions. This can help human judges resolve new cases much more quickly and efficiently by providing a starting point for them to think about each case, supported by a robust analysis of related case law and past precedent.

01
02
03
04
05
06
07
08

Making adaptive learning truly adaptive

(Education Tech: Learning Analytics for Adaptive Learning)

Using AI to deliver a one-on-one education experience that truly adapts to the needs and abilities of the learner.

The concept of learning systems that can intelligently adapt to the learner's unique needs and abilities has been around since the 1950s. And, of course, it's the way parents of all species naturally teach their offspring. However, when it comes to computer-based learning, traditional "adaptive" learning systems have been using simple decision techniques, such as branching, that provide only the most basic level of adaptation. With AI, on the other hand, adaptive learning systems can now be truly adaptive, tailoring their teaching approaches and content to each individual learner.

The Life Sciences & Health Care AI Dossier

To date, most organizations in life sciences & health care (LSHC) have only scratched the surface of AI's potential—primarily using it to automate repetitive tasks and standard business processes. However, AI is now widely recognized as a strategic business issue in this area and is actively being discussed at the board and C-suite levels.

By combining AI technology with the fields of medicine and science, organizations are looking for opportunities to transform some of their most critical processes and achieve sustainable competitive advantage through AI. In particular, AI has the potential to expedite drug development—helping researchers to identify and validate genetic targets, and to design novel compounds. AI also has the potential to help companies launch and market products more effectively, and to make supply chains smarter and more responsive.

According to a recent Deloitte survey about the use of AI in life sciences globally:[9]

- More than 60% of life sciences companies surveyed spent in excess of US$20 million on AI initiatives in 2019, and more than 50% of respondents expected their investments in AI to increase in 2020.

- The top outcomes that surveyed life sciences companies are striving to achieve with AI include: enhancing existing products (28%); creating new products and services (27%); and making processes more efficient (22%).

- Top challenges of respondents facing AI initiatives include: difficulty in identifying business cases with the highest value (30%); data challenges (28%); and integrating AI into the organization (28%).

AI is already proving its value in making processes more efficient, with 43% of the surveyed organizations reporting success in that area. And over the next three to five years, AI is expected to have a transformational impact on biopharma research and development (R&D), particularly for drug discovery. Meanwhile, life sciences companies will likely continue to conduct AI pilots and proofs-of-concept in many other parts of the value chain.

In health care, AI adoption is still largely in its infancy. However, it is quickly gaining traction—and ultimately AI is expected to have a huge transformational impact on the business of health care—and on how health care is delivered. Today, most early use cases for AI in health care focus on administrative tasks and basic automation, rather than more sophisticated clinical applications such as disease diagnosis and care delivery, which seem riskier and require higher levels of intelligence. However, more advanced AI applications are already emerging that demonstrate the practical viability of sophisticated clinical use cases (e.g., the use of AI for imaging diagnoses).

The main focus for AI in health care over the next several years should be on elevating and personalizing every aspect of the patient experience—from call center interactions and claim administration to care delivery and follow up. Patient-related activities that could greatly benefit from AI run the gamut from getting patients registered more quickly and making their visits more personalized and efficient, to using AI to create and execute truly individualized treatment plans based on a complex mix of datasets (including a patient's health history, lifestyle, genomic make-up, and personal preferences). This focus on the patient experience could create significant value for patients and providers alike, while setting the stage for longer-term use of AI in the most sophisticated clinical applications.

As AI becomes a standard business tool—and competitive necessity—organizations in life sciences & health care will need a clear vision and strategy for harnessing the power of AI. They will also need the building blocks in place to develop and deploy AI solutions at scale. These building blocks include: the right IT infrastructure; the right talent and skill sets; and alliances/ecosystems that enable them to develop or access the AI capabilities they need.

For most organizations, the single most important AI building block is data: getting access to the rich data that AI systems require, and then managing that data in a coordinated way across the enterprise. With robust data, the potential use cases for AI in life sciences & health care are nearly limitless.

Trials with less error
(Digital Data Flow for Clinical Trials)

Use cognitive automation to integrate trial data from multiple systems, populate standardized digital data elements, and generate trial artifacts such as case report forms and study reports.

Issue/Opportunity

There is no shortage of data associated with clinical trials. However, the traditional flow of data across the clinical trial lifecycle can quickly become a complicated maze marked by manual effort, rework, and inefficiency—leaving researchers feeling like they're working in 2003, not 2021.

How AI can help

Automate data management for clinical trials
Use AI to streamline data gathering and artifact creation tasks so clinical site investigators can focus on value-added services like patient engagement. Automate data management across the lifecycle by creating structured, standardized, digital data elements. Then use AI to intelligently interpret data elements and feed downstream systems and auto-populate required reports and analyses.

Create a single source of the truth
Accelerate clinical trials and improve decision-making by establishing an interoperable, intelligent, single source of the truth.

Use AI insights to improve the next trial
Foster continuous improvement by generating insights from past and current trials that can be used to inform and improve future trials.

Trials with less error
Managing risk and promoting trust

Security
Patient medical data is highly sensitive, and running afoul of applicable regulations governing how data can be used and stored may expose an organization to a variety of legal risks. Using AI to improve data gathering and create artifacts, organizations should think through how the tool and the computing infrastructure it uses can be secured against inappropriate or illegal patient data access.

Privacy
Patient trust in an organization can be harmed if AI models or datasets divulge sensitive information. Patients have a valid expectation that details of their disease or ailment are kept in strict confidence. Designing and managing AI in such a way that it aligns with privacy needs can bolster patient trust and amplify an organization's trustworthy reputation.

Robust and reliable
Errors in data management can propagate across numerous trials, imperiling insights, outcomes, and ROI. Confidence in how data flows are managed directly impacts trust in the automation tools and the outcomes of the trials themselves. As such, AI for data flows should be reliably accurate over time and robust in the face of novel or unexpected data.

Possible benefits

Faster trials at lower cost
The costs and time required to execute a clinical trial through smart automation and improved efficiency, with less need for rework can be significantly reduced.

Reusable data
The need to re-build databases across trials by using AI technologies to intelligently reuse existing data based on standardized data elements can be avoided.

Accelerated speed to market
By reducing the time and effort required for clinical trials, AI-enabled data management can accelerate the drug approval process and help companies get new drugs to market more quickly.

Smarter drug manufacturing
(Digital Data Flow for Clinical Trials)

Use algorithmic models and sensor data to maximize factory yield and productivity by predicting manufacturing deviations and pro-actively suggesting corrective actions.

Issue/Opportunity

Fixing manufacturing issues today requires laborious manual intervention to access multiple systems, with action taken only after problems occur. Applying AI to manufacturing data can help predict process bottlenecks, identify quality control issues, and pro-actively suggest corrective actions.

How AI can help

Analyze large volumes of data from multiple systems
Biopharma manufacturing data is often scattered across internal and external systems that lack interoperability and consistency. AI-based algorithms can process extensive amounts of data from disparate systems, intelligently and contextually aggregating, analyzing, and rapidly learning from plant floor, environmental, product, and quality release testing data.

Proactively improve manufacturing performance
AI-driven simulations and modeling can assess various parameters during the manufacturing process and recommend actions that: improve yield and output; address quality issues; and release free capacity through suggested and autonomously performed mitigation actions.

01
02
03
04
05
06
07
08

85

Smarter drug manufacturing
Managing risk and promoting trust

Robust and reliable
Brittle AI models that cannot function properly in the face of changing data can have serious implications for drug manufacturing, including impacts on human health. AI models can become brittle when small changes in the data lead to large changes in model output. Organizations should make sure testing and training data reflects all potential real-world manufacturing conditions and constraints.

Explainable
Given the high-precision nature of drug manufacturing, decision makers need to understand why predictive recommendations are accurate. Greater understanding can lead to deeper trust. Even if the math and data are difficult to explain in common language, an organization is still called to identify which stakeholders have a need to understand the AI function and the degree of explainability that is relevant to their duties.

Secure
The value of the manufacturing data, as well as the likely use of patented technology, requires a model and underlying data to be secured against compromise, theft, and inadvertent exposure. Important considerations include processes for securely storing and transferring data, coordination with an organization's cyber security professionals, and implementing supporting tools that harden a system against potential threats and attacks.

Possible benefits

Reduced manufacturing deviations and improved product quality
AI technologies can improve product quality by minimizing variations during the manufacturing process.

Higher yield
Pro-actively addressing process bottlenecks and production deviations can lead to higher output and yield.

Changing channels
(Drug Marketing Omnichannel Engagement)

Use machine learning models to predict the best ways to engage with patients and health care professionals (HCPs)—and to optimize marketing spend across media channels.

Issue/Opportunity

As customer preferences evolve and competition among drug manufacturers heats up, brand engagement is becoming more important than ever. Yet many companies still struggle to answer the critical questions that drive ROI on their digital marketing investments: Which channels should I invest in? Who should I engage with? And what content is right for them?

How AI can help

Predict the best ways to engage with patients and HCPs
Use machine learning models based on promotional and longitudinal data to predict how, when, and with what message type to best engage with patients and HCPs.

Optimize marketing spend across channels
Generate channel spend recommendations to drive campaign ROI, using performance and payback as metrics to inform future budgets.

Personalize cross-channel engagement
Analyze target personas and predict behavioral responses across various channel-content combinations. Develop customized content that is relevant, authentic, and based on a holistic view of the patient or HCP. Align timely marketing messages and behavioral nudges across the customer journey.

01 02 03 04 05 06 07 08

87

Changing channels
Managing risk and promoting trust

Privacy and security
When dealing with medical information and relationships, an AI model and data should be secured against compromise and treated with care to respect personal privacy. Failing to do so can present a host of risks to an organization. Using patient and HCP personas to predict behavioral responses yields highly sensitive and valuable datasets that may be attractive to cyber criminals. There may also be laws and regulations dictating how the data is treated.

Transparent
In promoting brand engagement using AI, consider who needs to understand that AI is being used in a drug marketing capacity. Should patients and HPCs be made aware AI is deployed? What about regulators, lawmakers, and oversight bodies? Consult internal standards and rules for technology ethics and disclosing practices, as well as applicable laws, to determine the appropriate degrees of transparency around the AI lifecycle and data collection to minimize risk.

Responsible
Using AI to persuade patients and HPCs may help marketing efforts, but consider whether it is a responsible choice to use the tool in the context of health and well-being. What risks could deployment create for the organization? What steps can the organization take to mitigate negative outcomes that can be foreseen? Are processes in place to address negative outcomes that cannot be foreseen?

Possible benefits

Increased marketing ROI
AI technologies can increase the efficiency and effectiveness of a company's marketing spend.

Improved customer engagement
Predictive AI and machine learning enable companies to anticipate each customer's needs and deliver a consistent experience across all channels.

Higher customer conversation rates
By understanding and anticipating the needs of patients and HCPs, AI can help spur them into action.

01
02
03
04
05
06
07
08

Active listening
(Voice of the Patient Insight)

Use AI to analyze patients' and HCPs' social media feedback, complaints, and adverse events—generating insights that can improve product design, packaging, and educational materials.

Issue/Opportunity

With the rise of social media and other online forums, life sciences companies have a prime opportunity to tap into patient and HCP narratives—such as complaints, medical inquiries, and social media posts—to derive product intelligence and improve product development. Deeper insight about customer needs and concerns can inform product development and messaging—helping to ensure patients understand the products available to them, and that they receive optimal care.

How AI can help

Enable data-driven decision making
Use AI technologies and insights to transform decision making from "we think" to "we know."

Gather and analyze data from multiple sources
Intelligently mine product information from various sources to capture the Voice of the Patient (and Voice of the HCP).

Generate actionable recommendations and insights
Create actionable insights that can augment decision-making across the value chain and improve product intelligence.

Transform product development
Fundamentally change how the next iteration of products is developed.

01
02
03
04
05
06
07
08

89

Active listening
Managing risk and promoting trust

Privacy

In gathering and probing data to better understand patient needs and concerns, explore whether privacy risks emerge by virtue of collecting patient and HCP data from online exchanges and feedback. Mining data from multiple channels can create sensitive datasets that raise questions around user and customer privacy. Laws and regulations may be applicable and dictate limits on what is allowed as it relates to data collection. Consult with the organization's legal and compliance professionals as a regular component of the AI lifecycle.

Fair and impartial

Deriving insights from online interactions may present a risk of an incomplete or biased dataset. Some patients and HCPs may not engage on social channels. This can lead to self-selection bias in the resulting dataset, where the data is not fully representative of patients and HCPs. The resulting insights may then favor those who engaged online while potentially missing valuable insights from those who did not. Mitigating bias in the data can lead to more valuable outcomes.

Possible benefits

Increased customer satisfaction (with fewer complaints)
By deepening a company's understanding of customer needs and concerns, AI can improve satisfaction and reduce the need for customers to vent their frustrations online.

Improved product design and engineering
The insights derived from intelligently mining social media and other customer data sources can help companies design better products.

01
02
03
04
05
06
07
08

Compliance amidst complexity
(Proactive Risk and Compliance)

Use AI to automate the analysis and aggregation of data when identifying risk and compliance issues—recommending the next best action and possible mitigation methods.

Issue/Opportunity

The life sciences industry is subject to a high level of government regulation, both locally and globally. Such regulation is important to ensure—among other things—that products and treatments are safe and effective, and that pricing and contracting are executed in a compliant manner. However, achieving compliance with the global industry's complex mix of regulations can be difficult and costly.

Ineffective compliance processes in life sciences can delay product development, creating a negative impact for everyone involved—including manufacturers, HCPs, and patients.
As such, failure to address risk management and compliance issues is not an option.

How AI can help

Analyze the impact of policy changes in real time
Using natural language processing, policy changes can be analyzed for impact in real time, with AI and machine learning applications identifying what information matters, why it matters, and who it matters to most.

Enable real-time risk assessments and compliance monitoring
Robotic process automation, AI, and machine learning can enable real-time risk assessments and real-time auditing/monitoring of regulatory compliance, providing immediate notifications and information about detected issues.

Conduct sophisticated, multi-source analysis of compliance risk areas
AI-enabled data analysis can identify critical areas of compliance risk—such as fraud, kickbacks, and off-label discussions—and then highlight potential techniques and actions for mitigation.

01
02
03
04
05
06
07
08

Compliance amidst complexity
Managing risk and promoting trust

Robust and reliable

Accuracy is vital in AI designed to monitor regulatory compliance. Inaccurate outputs can lead to costly regulatory violations. As such, it is especially important to mitigate model drift in AI management, as well as validate the accuracy of AI outputs over time. This active attention to robustness and reliability can help an organization avoid costly repercussions from AI errors.

Accountable

In instances where the AI fails and there are consequences, who is accountable for the outcomes? One component of mitigating or preventing failure is ensuring that there are people accountable for testing and oversight, potentially correcting problems before they occur. Stakeholders should be aware of their accountability, and it should be documented, embedded in processes, and enforced.

Possible benefits

Lower compliance costs
A simpler, faster way to manage global compliance requirements can save time, money, and resources.

Fewer errors
AI-enabled compliance can reduce the human element, minimizing compliance errors and related consequences such as regulatory fines and reputation damage.

More agile compliance processes
Changes to AI-based compliance processes can be implemented at the push of a button, instead of requiring extensive communication and retraining for human operators.

360° engagement
(Patient Engagement)

Use AI to improve every aspect of patient engagement, from scheduling appointments and accessing medical records to communicating with health care staff and care coordination teams.

Issue/Opportunity
Patients today often face significant challenges when trying to access, understand, and manage their care. Many patients struggle to book appointments, access medical records, determine which services are available to them, and get answers to simple logistical questions. This can cause them to become disengaged and can impair their ability to make fully-informed decisions about their health care.

How AI can help

Make complex medical information easier for patients to understand
Natural language processing can parse complicated medical information/data into meaningful insights for patients—and then communicate those insights to them, increasing their health literacy.

Streamline communication between health care workers by filtering out extraneous information
AI and machine learning solutions can improve internal communication between health care workers by enabling systems to collect and share relevant information only with those who need it.

Accelerate and improve database searches
AI-enabled databases can execute queries faster and more accurately, reducing the time required to find information and improving database reliability.

Make chatbots smarter
Natural language processing and machine learning can train chatbots to perform better on a wide range of tasks, such as addressing patient questions, scheduling appointments and calls, and referring patients to other departments. Chatbots and call automation can also be used for outpatient follow-ups and check-ins.

Create and execute personalized plans for engaging with patients
Prescriptive analytics can suggest personalized next best actions for patients, with appropriate "nudging" and other tailored engagement activities.

01
02
03
04
05
06
07
08

93

360° engagement
Managing risk and promoting trust

Fair and impartial

If datasets are not fully representative of a diverse population, the AI trained on that data may fall short of creating personalized health plans that are applicable and realistic for all users. Bias in data may result from over- or under-representing certain characteristics. This can yield varying qualities of personalization from one user to another, and that will directly impact trust in the tool.

Security

Medical records and care management data are sensitive and their treatment should be appropriately safeguarded. If sensitive records are somehow divulged or accessed by third parties outside an organization, it may harm patient trust in the organization and even healthcare services more broadly, in addition to possibly causing legal and regulatory ramifications. Organizations should handle data appropriately, and design and use the model with particular concern for patient privacy.

Robust and reliable

Consistently accurate outputs are critical for health decisions. If the AI is inconsistent in its function or the quality of its outputs degrades over time, the consequences can be severe, ranging from causing patients to disengage from new healthcare tools to giving people incorrect information that compromises their health. Rigorous testing and post-deployment management can promote robust and reliable AI.

Possible benefits

Lower compliance costs
A simpler, faster way to manage global compliance requirements can save time, money, and resources.

Fewer errors
AI-enabled compliance can reduce the human element, minimizing compliance errors and related consequences such as regulatory fines and reputation damage.

More agile compliance processes
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01
02
03
04
05
06
07
08

Next-level claims handling
(Health Care Revenue Cycle Optimization and Efficiency)

Use AI to automate claims submission and payment for pre-care, day-of-care, and post-care activities.

Issue/Opportunity

Medical claims management is a time-consuming and resource-intensive process that can extend or delay pre-care, day-of-care, and post-care activities. Health care providers spend vast resources standardizing, validating, and corroborating millions of claims per year—in some cases relying on third-party vendors to manually review claims and input data into files for claim validation. This process is often expensive, slow, and prone to errors.

How AI can help

Automate claims data extraction and input
Robotic process automation tools can intelligently extract information from large quantities of structured and unstructured data without manual involvement.

Provide real-time status updates and monitoring
An automated system can provide real-time status updates, summary information, and claims monitoring.

Automate follow-ups and denials
Repeatable tasks related to claims, follow-ups, and denials can be carried out instantly by RPA tools, without manual processing and control.

Analyze filed claims in real time
AI-enabled data analysis can provide real-time insights on filed claims.

01
02
03
04
05
06
07
08

95

Next-level claims handling
Managing risk and promoting trust

Robust and reliable

When data extraction and input is automated, errors can occur at scale, potentially leading to laborious rechecking, lost revenue, and reputation damage. Mitigating these risks in claims handling requires consistent accuracy. Because model function can drift over time and when encountering novel data, monitoring AI robustness is an important component in validating reliability.

Security

Claims processing can be a target for fraud. As data extraction and monitoring is automated, organizations should explore whether the AI is susceptible to targeted attacks, such as data poisoning that could trick the AI into inaccurate outputs that criminals can exploit. Important considerations include how data is transferred and stored and the processes for monitoring the network of technologies.

Possible benefits

Faster
Cheaper. More accurate. AI-enabled solutions can process claims more quickly and accurately than can humans (such as claims representatives and revenue analysts), saving time and resources for providers and patients alike.

More agile
Claim and denial processes can be changed with little or no retraining of staff.

Next-level diagnosis
(Computer Assisted Diagnosis)

Use AI technologies to diagnose medical conditions more efficiently and accurately.

Issue/Opportunity

Diagnosing medical conditions is a difficult and complex task that hinges on a wide variety of factors—including not just a patient's current symptoms and test results, but also numerous other factors such as genetic background, lifestyle, and detailed medical history—much of which is not readily available to human medical practitioners using traditional systems and processes.

How AI can help

Analyze vast quantities of medical data
AI can analyze vast amounts of medical data from a wide range of sources and then connect the dots, uncovering complex patterns and disease characteristics that humans might not be looking for.

Provide recommendations to medical practitioners
Through focused application of AI technologies such as deep neural networks, machine learning, and categorization, medical practitioners can rely on AI for more accurate and efficient analysis of patient data.

01
02
03
04
05
06
07
08

Next-level diagnosis
Managing risk and promoting trust

Robust and reliable

AI accuracy is paramount in health care because of the potential impact on patient health. Inaccurate outputs from AI may contribute to an inaccurate diagnosis and could have a poor health outcome. Thus, the AI tool needs to be reliable and accurate in all applications over time. What is more, patients may present relevant data that was under-represented or not represented at all in the training and testing data, making robustness an essential quality of trustworthy diagnostic AI.

Responsible

The potential value from diagnostic AI in healthcare is so significant that organizations should weigh the risks of deploying an AI, as well as the risks of not deploying it. If a model delivers valuable recommendations 70% of the time, but those recommendations save lives, is it a responsible decision to move forward with deployment? Consult with the range of stakeholders to assess the most important factors in responsible AI deployment.

Explainable

There is a trade-off between explainability and accuracy. The task for organizations deploying diagnostic AI is to identify the right balance, recognizing that different stakeholders may require different levels of technical understanding to perform their roles. While healthcare providers may only need a limited grasp of how the AI works, the data science stakeholders may need a much deeper, more technical understanding of the AI to coordinate data flows and resources in the complex healthcare technology environment.

Possible benefits

Improved accuracy and lower costs
AI can help automate the diagnostic process, improving accuracy while potentially reducing operational costs.

Improved efficiency so medical practitioners can spend more time with patients
AI and machine learning can help with diagnosis to improve efficiency, giving medical practitioners more time to focus on activities such as patient interaction and support.

Medicine that is truly personal
(Precision Medicine & Personalized Health)

Use predictive insights to proactively diagnose, prevent, and treat a future illness based on an individual's lifestyle, real-world environment, biometric data, and genomics.

Issue/Opportunity

Precision medicine (taking into account an individual's genetics, environment, history, and lifestyle when considering medical options) has emerged as an effective and cost-efficient form of disease treatment and prevention. The increasing availability and quantity of medical data—both an individual's data, as well as anonymized historical medical data—is enabling medical practitioners to be more precise in addressing a patient's needs and assigning treatments specifically suited to that individual.

How AI can help

Find connections across multiple datasets
Machine learning algorithms can link treatment outcomes to a variety of health datasets (such as patient data, medical literature, lifestyle information, genetic makeup, and medical history), providing detailed insights and predictions for health care professionals to act on.

Quickly collect and analyze vast amounts of data
With AI and machine learning capabilities, life sciences companies can collect, store, and analyze large datasets far more effectively than through manual processes. This enables them to conduct research more quickly—based on data about genetic variations from a huge number of patients—and to develop targeted therapies faster.

Develop personalized treatments and care
Through AI analytics, health care providers can discover, present, and utilize information based on an individual's unique characteristics. This facilitates the delivery of care personalized for each patient.

Medicine that is truly personal
Managing risk and promoting trust

Fair and impartial
Health datasets may contain hidden biases, creating risks to health insights and the appropriateness of treatments. Important questions to ask include, are all demographics and genders equally represented in the data? Can this data be supplemented or acquired through other means? What are the mitigating steps that can be taken to remedy bias? To establish trust in the tool requires outputs to be equally valid for all stakeholders.

Privacy
The way personal data like biometrics and DNA is stored, used, and disclosed is protected by laws and regulations that vary across geographies. Just as important, patients expect that their personal data will be kept confidential by their health care provider. By prioritizing privacy during model training and testing, the organization can mitigate risks to customer brand perceptions, as well as address legal and regulatory concerns.

Security
Similar to privacy, how personal data is stored and protected is often mandated by governments and is expected by patients. If sensitive data is divulged, either through an AI function or in how the supporting technologies are secured, it can harm trust in AI and the organization itself among patients and health care providers alike.

Possible benefits

Earlier diagnosis that improves effectiveness and reduces costs
A comprehensive and detailed view of a patient's medical status and genetic makeup can enable early diagnosis, even before symptoms appear. Earlier treatment is often more effective, less costly, and promotes healthy lifestyle changes.

More effective treatment
Medicine designed specifically for an individual (instead of a "one size fits all" drug) can be more effective in treating medical issues, potentially saving money and resources in the long run.

Healthier social norms
A more empirical, data-driven understanding of how lifestyle affects health care outcomes can inform and foster healthier societal behaviors.

Smarter hospitals
(Hospital Management)

Use predictive AI to forecast peaks and valleys in patient volume and then adjust hospital staffing and resource levels accordingly.

Issue/Opportunity

Health care organizations don't just make medical decisions on behalf of their patients; they also make operational decisions on behalf of their own business. And like any business, hospitals need to ensure that supply adequately meets demand. Demand for health care rises and falls in response to a complex range of factors, making it difficult for hospitals to optimally allocate their supply of critical resources such as medical equipment and staff.

How AI can help

Predict future resource needs based on historical data and real-time situation analysis
Data mining, modeling, and AI can help organizations make predictions based on historical data and real-time situation analysis. For example, AI-based prescriptive analytics can provide indications of future resource needs for different scenarios (e.g., determining the optimal inventory to satisfy an uptick in hospital readmission, or what new machinery/supplies are needed to meet seasonal demand).

Comprehensively analyze large amounts of detailed data
AI and machine learning can analyze all available data comprehensively and in great detail can provide a much clearer picture of health status.

Identify high-impact patterns and trends
Thorough, AI-enabled analysis of various data sources can reveal hidden trends and patterns with the potential for large-scale impact (e.g., areas at high risk of supply shortages).

Smarter hospitals
Managing risk and promoting trust

Explainable
For business planners to trust the AI's predictive recommendations, they require knowledge of how it functions and why it is correct. This understanding may not need to be technical. If planners have confidence in the data and the AI's capacity to identify clear trends and future needs, that may be sufficient for trust, even without an understanding of the data science.

Robust and reliable
Health care organizations using this type of predictive AI rely on it to be accurate, making maintaining accuracy essential for users to trust the tool. Trustworthy AI used to predict staff and resource demands is reliably accurate over time and capable of maintaining accuracy if the operating environment presents the AI with unfamiliar data.

Possible benefits

Faster resource level adjustments, leading to lower costs and better outcomes
When health care organizations are aware of possible future scenarios, they can respond more quickly (or even take pre-emptive action), potentially reducing costs and creating better health outcomes.

Anticipating and addressing major risks before they happen
Prescriptive analytics enabled by AI can highlight areas of large-scale risk, helping organizations avoid institutional failure and sub-optimal health outcomes for patients.

Needle in a haystack
(Biomarker discovery)

Using AI to analyze life sciences data and identify novel biomarkers through pattern recognition.

When it comes to discovering and developing new drugs, the biggest breakthroughs are often hidden in massive and complex datasets. Machine learning and deep learning techniques can be very effective at analyzing life sciences data and using pattern recognition to identify novel biomarkers. This can increase the efficiency of biomarker analytics and accelerate the drug development process—enabling life sciences companies to discover innovative treatments more quickly and get them to market faster.

Origin of species in the age of AI
(Synthetic biology)

Using AI to engineer new synthetic life forms that serve useful purposes.

Advanced research is currently underway that is focused on using machine learning and deep learning to synthesize new life forms with valuable new capabilities. At this early stage of experimentation, the emphasis is largely on computational biology and chemical manufacturing applications that use AI to manipulate simple organisms and assist with biolab automation. However, over time, the scope of research is sure to expand—with successful applications getting more funding and unsuccessful applications getting cut off.

Simulating new drugs in a virtual lab
(Virtualized Drug Discovery Lab)

Using AI, quantum physics, cloud computing, and a molecule database to create a "digital twin" for simulating the activity of potential new drugs.

A digital twin is a virtual model that perfectly mimics the characteristics and behaviors of something that exists in the physical world. Applied to the task of drug discovery, digital twins have the potential to dramatically improve the efficiency and effectiveness of drug research and development. Drawing on content from comprehensive molecule databases, AI algorithms can predict the interactions between molecules and proteins at the atomic level, and can map out potential drugs' pharmacologic properties. This will make it easier for biopharmaceutical companies to pick the best candidates for clinical studies—accelerating the R&D process and reducing the amount of failed experimentation.

01
02
03
04
05
06
07
08

Supply chain, heal thyself

(Self-healing supply chains)

Using AI to create optimized, proactive supply chains that can automatically address unexpected disruptions.

In life sciences, many of today's supply chains are inflexible, slow-to-respond, and reactive—problems that revealed themselves all too clearly in the early days of COVID-19 when supply lines ground to a halt and expiring goods were stuck wasting away in warehouses and shipping ports around the world. AI can help life sciences supply chains predict supply and demand more accurately, improve visibility and transparency, automate warehouses using RPA, and enable just-in-time inventory management and distribution throughout the global supply network. In addition, AI can proactively monitor supply chain problems and autonomously perform the vast majority of mitigation activities on its own—only requiring human involvement for truly exceptional issues, and then using machine learning to understand how to address such issues autonomously in the future.

True grit
(Predictive Behavioral Model)

Using AI to select clinical trial participants who won't drop out.

Clinical trials are a critical bottleneck in the drug approval process—and one of the biggest challenges with trials is choosing patients who will have the staying power to see things through to the end. A clinical trial is demanding and time consuming, and participants have no idea if they are receiving the actual treatment or a placebo, making it hard for them to stay motivated. Patient attrition is very costly ($41k per participant, on average) and in some cases can even invalidate a trial completely, pushing the process back to square one. AI can help by analyzing behavioral factors such as socio-economic data, education, spending patterns, and emotional support—in addition to traditional clinical factors such as disease protocol data—calculating a "grit" score that shows which participants are most likely to remain fully engaged until the trial is complete. AI can also help life sciences companies design trial protocols, engagement strategies, and participant interventions that are more personalized and effective—further reducing attrition and fueling continuous learning and improvement.

Beyond the microscope
(Digital Pathology)

Using AI to increase the speed and accuracy of disease diagnosis.

Pathologists use studies of body fluids and tissues (such as blood tests and biopsies) to understand the causes, nature, and effects of diseases. This process has long revolved around looking at glass slides through microscopes (unlike radiology, where traditional processes have been almost entirely supplanted by digital technologies and workflows). However, as digital pathology gains traction, AI is expected to play an increasingly important and valuable role in diagnosing and treating diseases. For example, with medical images such as the output from a cryogenic electron microscope, AI can discern patterns and details that are imperceptible to humans—helping pathologists quickly and accurately determine the best way to treat a patient's disease.

Health care you wear

(Patient Vitals Monitoring)

Using AI to analyze and identify anomalies in patient vitals data captured through wearable devices.

Smart watches and other wearable sensor devices are all the rage these days. And for good reason. Data captured from body sensors and wearable devices—such as bracelets, heart monitors, patches, and sensor-enabled clothing—can not only be used to track the wearer's activity and fitness levels for recreational purposes; it can also be used for medical purposes to continuously monitor a patient's vital signs remotely or in hospitals and care clinics. Health care providers can then use sophisticated tools based on AI and machine learning to analyze multidimensional time-series data and identify anomalies that require attention. This breakthrough capability enables a patient to receive high levels of monitoring and care without being stuck in a hospital bed wired to a bunch of machines.

01
02
03
04
05
06
07
08

Remembering to take your medicine

(Medication Compliance & Remote Patient Monitoring)

Using AI image recognition and smartphones to remotely monitor outpatient behavior and whether patients are taking their medications as directed.

Getting patients to take medications on time is a seemingly trivial problem that is actually very serious and surprisingly difficult to solve. And it's especially crucial for drug trials, where lack of compliance with a trial's protocols can completely invalidate the results. Thankfully, using AI image recognition and basic smartphone capabilities, health care providers can now offer patients an easy way to demonstrably adhere to drug trial protocols. Also, AI can be used to monitor and analyze many other aspects of outpatient behavior, including nutrition and sleep patterns. This additional insight can be extremely valuable, since the behavior of outpatients can vary widely.

AI that heals
(Digital Health Care Providers)

Using AI to help medical professionals provide a wide range of health care services.

Although there is no good substitute for human touch and compassion, AI-powered systems and robots have the potential to assist with many other aspects of health care delivery, including helping diagnose and treat common infections; assisting nurses with patient monitoring; helping radiologists analyze and interpret imaging data; and even supporting surgeons as they prepare for and perform complex operations. And as AI becomes more capable—and patients and health care professionals become more comfortable with it—the potential use cases will likely only grow more sophisticated.

01
02
03
04
05
06
07
08

Seeing what the human eye can't
(Diagnostic Image Enhancement in Radiology)

Using AI technologies to enhance and analyze radiological images.

Radiologists specialize in diagnosing and treating injuries and diseases using medical imaging procedures that can see inside the human body, such as X-rays, MRIs, CT scans, PET scans, nuclear medicine, and ultrasounds. Earlier uses of AI for diagnostic imaging were dependent on manual feature selection to define the "class" of the image, which limited their effectiveness. However, as future AI technologies grow more capable and accurate, they are expected to be increasingly used to enhance and analyze images in which key structures are not visible to the human eye—augmenting the images and creating detail within pixilation so radiologists can make an accurate diagnosis. AI can also be helpful in situations where human radiologists are not available, or where their case load is overwhelming.

The Technology, Media & Telecommunications AI Dossier

In technology, media, and telecommunications (TMT), AI adoption and maturity vary significantly by sector.

Telecom companies tend to be the furthest along at embracing AI, thanks to the sector's longstanding focus on operational efficiency and customer acquisition/retention. AI technologies are already in widespread use both for customer-facing activities such as contact centers and customer engagement, and for back-office activities such as manufacturing and logistics. Looking ahead, the sector's successful track record with AI in these areas is encouraging telecom companies to expand their AI efforts into new areas. One area that will likely be a particularly strong focus within the next few years is using AI for predictive analytics that can turn telecom companies' wealth of customer data into valuable insights that can further boost acquisition and retention.

Many technology companies have been slower to embrace AI. Digital natives such as Google, Amazon, and Facebook are using AI in very sophisticated ways, particularly in their commercial products and services. However, AI adoption and maturity at other types of technology companies are significantly lower,

with many companies insisting on seeing sector-specific use cases and proven results before scaling up their AI programs and investments. Also, many existing AI efforts in the sector are limited to scattered experiments and small-scale pilots, without an overarching strategy for harnessing the full power of AI and digital data.

That being said, as in many other industries, the impacts of the COVID-19 lockdown have accelerated interest and investment in AI and digital transformation, particularly for common AI applications such as robotic process automation (RPA), as well as more advanced use cases such as smart factories and digital supply chains.

In the media sector, most of the focus for AI has been on personalizing content and customer engagement—and this trend could increase in the future. During the COVID-19 pandemic, many media companies enjoyed a sharp rise in subscriptions and revenue, and as the crisis subsides and people start returning to their normal lives, there will be a scramble to retain as many customers as possible. Success will likely hinge on providing consumers with the best possible experience and content, which can create an even greater need for AI-driven personalization.

As in many other industries, the impacts of the COVID-19 lockdown have accelerated interest and investment in AI and digital transformation, particularly for common AI applications such as robotic process automation (RPA), as well as more advanced use cases such as smart factories and digital supply chains.

Factories and supply chains that think and feel
(Smart Factory and Digital Supply Network)

Use AI to optimize the contract manufacturing process through micro services, and to accelerate demand planning, improve demand signals, and tightly integrate cross-functional supply chain processes.

Issue/Opportunity
Rapid technology advances have increased the complexity of the global supply chain, which in turn has led to global fragmentation of demand and production. However, with the advent of industrial IoT—and sensors being installed everywhere in factories—companies have a wealth of new opportunities to accelerate planning, improve forecasting, and optimize production schedules by using AI to deeply analyze demand and production data.

How AI can help

Enable smart production
Smart factories can apply AI to data from "connected" machinery and devices. By using AI to analyze the constant stream of data from connected operations and production systems, smart factories can fine tune their operational procedures—and can learn and adapt to new and changing demands.

Enable the digital supply chain
AI algorithms embedded within a supply chain can use historical data to analyze trends and streamline operations. This digital supply chain capability allows every component in the network to perceive and react to supply chain events at a granular level, optimizing results for the factory and customer alike.

01
02
03
04
05
06
07
08

Factories and supply chains that think and feel
Managing risk and promoting trust

Robust and reliable
In the factory environment, the multitude of sensors, machine data feeds and other information sources may introduce unfamiliar or even inaccurate data. Trustworthy AI models remain robust and reliable over time, even when encountering novel data. Validating reliability and managing for accuracy over time can facilitate a robust AI solution.

Secure
Smart factories thrive on proprietary data and often use patented technologies, valuable information that may be targets for bad actors or that could harm the enterprise if inadvertently disclosed. These high-value assets should be secured against known and potential cyber threats, and as such, an organization's security leaders should have regular input when shaping and improving the AI lifecycle.

Explainable
The technical function of predictive AI used to optimize the supply chain may be opaque to end users, but trust in the tool requires some appreciation of the data it consumes and the reason for its predictions. Consider which stakeholders need to understand AI functions, as well as the depth of that understanding.

Possible benefits

Improved asset efficiency and production capacity
AI can increase asset efficiency, optimizing production capacity and reducing asset downtime and changeover time.

Lower costs
AI enables more cost-efficient processes and higher product quality, which can reduce the costs associated with warranty claims, maintenance, product recalls, and returns.

Improved environmental sustainability
AI can help optimize resource usage, leading to a smaller environmental footprint.

Engagement elevated
(Direct Consumer Engagement)

Use AI to automate engagement and communication with customers, predict customer behaviors and next best actions, and increase personalization.

Issue/Opportunity

The way that consumers engage with brands has fundamentally changed and will likely continue to do so as technology advances. Yet, many businesses have still not adapted their customer service strategies to new digital trends and end-user preferences. Instead, they continue leading customers down the traditional, outdated engagement path. Excessive choice, reduced attention spans, and digital overload exacerbate the problem, creating an even greater need for authentic, two-way communication.

How AI can help

Enable automatic two-way communication through SMS
By combining lead management with natural language processing, customer intent and sentiment can be analyzed to determine the appropriate response. This automation technology significantly reduces the need for manual intervention and can also be used to prioritize leads.

Improve personalization using data management platforms.[10]
Delivering personalized products and services requires significant computing power. AI-powered data management platforms (DMPs)—aided by advanced analytics—can leverage data from a variety of sources such as ERP, mobile, and CRM systems to create increasingly personalized offerings.

01
02
03
04
05
06
07
08

118

Engagement elevated
Managing risk and promoting trust

Fair and impartial
Test and validate whether the AI outputs are consistently relevant and valuable for all customers, equally. If the training and testing data is not fully representative of all users or if it contains bias toward one group over another, the resulting personalized engagement may also be biased. The risk is that the organization may be missing out on maximum potential value from all customers because the AI operates with a bias.

Transparent
Determine whether it is necessary or appropriate to inform customers when they are interacting with an AI. Weigh the risks of doing so and not doing so. If a customer believes that they are engaging with a human employee and later learns they were not, what does that mean for customer trust in the organization? Could a tool deployed to enhance customer engagement potentially degrade it without sufficient transparency?

Privacy
In collecting and using customer data to present personalized offerings, trust in the tool and the organization using it depends in part on whether personal information is inappropriately or inadvertently exposed. Important considerations are how data is being used and shared across platforms. Digital privacy laws and regulations are proliferating, creating a legal requirement to hold customer data in confidence.

Possible benefits

Higher customer satisfaction and retention
Enhanced service quality and personalization can increase customer satisfaction. AI-powered tools can provide a centralized platform for managing customer interactions and prioritizing activities so that customers don't feel ignored, significantly improving the customer experience.
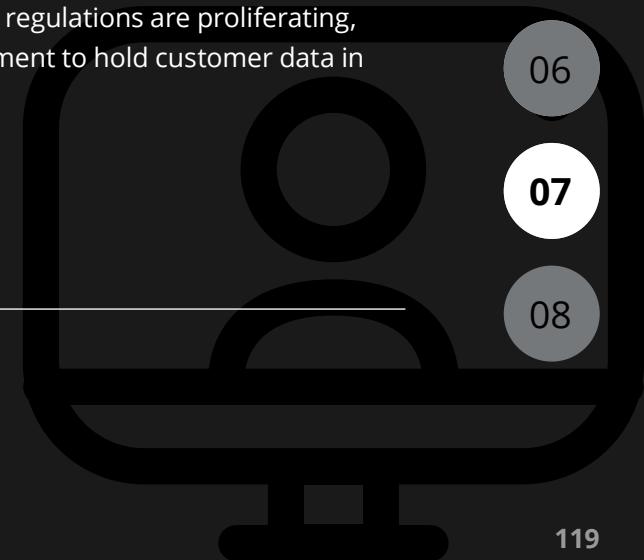
Making contact
(Digital Contact Center)

Use AI technologies such as natural language processing and machine learning to build Voice Virtual Assistants that are more efficient, engaging, and human-like.

Issue/Opportunity

As companies grow, they have traditionally needed a larger human labor force to support their higher volume call center operations. And while automated call monitoring technology has improved over time, most of today's IVR systems and chatbots are still based on basic word recognition and simple file retrieval, and are not sensitive to the context of a discussion. A digital contact center that uses AI technologies such as natural language processing and machine learning can be more predictive and sophisticated, significantly improving the customer experience while reducing the need for human involvement.

How AI can help

Voice Virtual Assistants
AI-based natural language tools and machine learning models can be used to build Voice Virtual Assistants that deliver a more efficient, engaging, and human-like customer experience. These tools can train chatbots to answer questions, schedule appointments and calls, and refer customers to the department most appropriate to handle their requests.

Omnichannel quality management
Using predictive analytics and sentiment analysis, all interactions on all digital channels can be monitored, providing valuable insights about both customers and call center staff. This gives managers real-time information for retraining workers or deciding on the next best action.

01

02

03

04

05

06

07

08

120

Making contact
Managing risk and promoting trust

Fair and impartial

With natural language, the completeness of the dataset can directly impact the effectiveness of the tool, the customer impression of the company, and ultimately the ROI from the AI deployment. To mitigate these risks, assess whether the data has an over- or under-representation of vocabulary, colloquialism, pronunciation, and other language factors that could result in customers receiving divergent quality of service and engagement.

Robust and reliable

AI reliability can have a direct impact on customer impressions and create risks or opportunities for the brand. Explore the degree of reliability required for virtual assistants to meet customer needs. Is an assistant that achieves 95% accuracy sufficiently accurate? What is the customer threshold for error before they disengage and have a diminished view of the organization's customer service?

Possible benefits

Improved customer satisfaction with less manual involvement
AI can help boost overall call center performance metrics—including customer satisfaction—while reducing the amount of manual intervention required to address customer queries.

Lower costs
Less manual intervention means lower operating costs, since the labor force required to support AI-enhanced call centers can be significantly smaller.
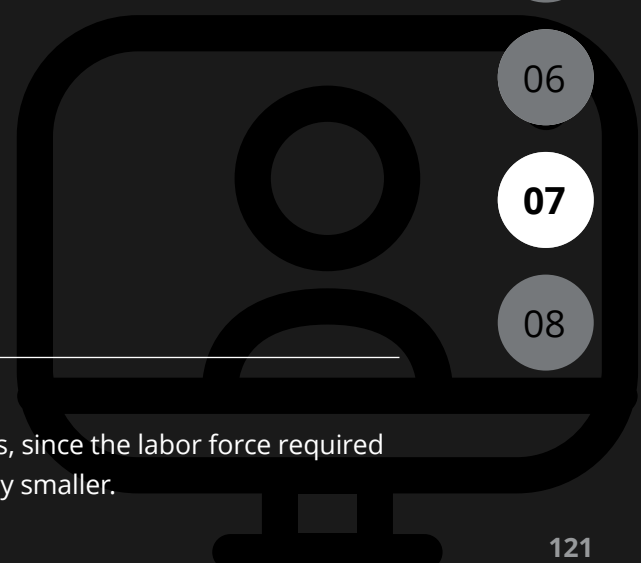
No faking
(Detect Fake Media Content)

Use advanced AI technologies to detect 'deepfakes' and fake syntheticmedia content by identifying subtle anomalies.

Issue/Opportunity
Deepfakes are fake audio and video content created using advanced AI technologies. As AI algorithms and machine learning grow more sophisticated, it becomes easier to create and spread this malicious content—potentially doing significant damage to the reputations of entities and people.

Detecting and limiting the spread of deepfakes and other fake content is increasingly essential to keeping misinformation at bay and preventing public harm. Although humans can sometimes detect deepfakes, the task is getting harder as the technologies used to generate fake content become more capable.

Ironically, while AI is a key enabler for creating deepfakes, it is also one of the best way to combat the problem. Advanced AI and machine learning algorithms—particularly neural networks—can be trained to detect deepfakes and other fake content in real time, thereby limiting their spread.

How AI can help

Detect deepfakes
Neural networks that have been trained to detect deepfakes can recognize telltale patterns and subtle inconsistencies within doctored media files. For example, AI-based detection algorithms can pick up subtle fading or greyscale pixels around a person's face in altered photographs.

Detect fake media content
AI combined with optical character recognition (OCR) can quickly scan and analyze digitized text to determine whether an article headline matches the article body, or whether an author's writing style in the current article matches their style in prior articles. Any anomalies can then be flagged for human verification.

01
02
03
04
05
06
07
08

No faking
Managing risk and promoting trust

Robust and reliable
While deepfake media may be indistinguishable from real media to the human eye, AI analyzes media on a mathematical level, where differences may be more apparent. In this data, the AI faces a challenge of robustness and requires the capacity to deliver accurate outputs regardless of the novel data it encounters.

Secure
Any AI that successfully detects deepfakes may become an attractive target for bad actors. If they understand how the AI works, they can develop approaches to evade it. When designing and deploying AI, factor in security capabilities that can guard against attacks, such as data poisoning or exploiting transfer learning.

Explainable
A potentially important quality of AI in detecting deepfakes may be how well the tool and its supporting infrastructure can be explained to technologists as well as laypeople. In case of litigation, for example, the organization may be required to explain how the tool determined whether content is legitimate or fake.

Possible benefits

Limiting the spread of fake content and misinformation
AI enables real-time detection of deepfakes and other fake content. Given the sheer volume of online content being generated, this problem can be nearly impossible to manage without the help of AI technologies.
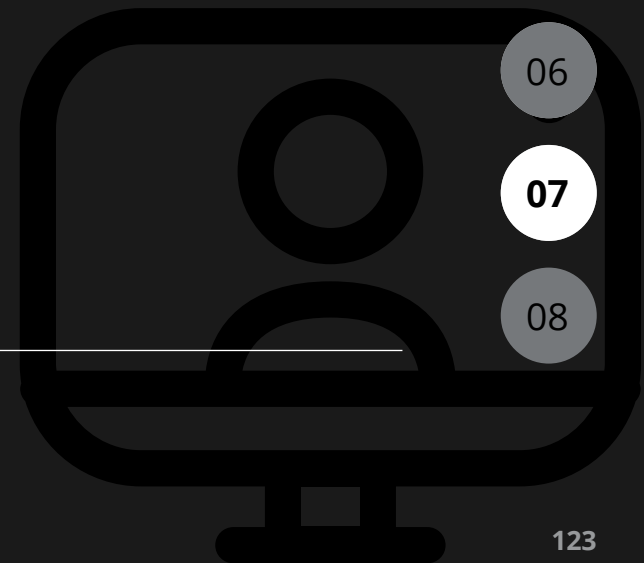
Turning customer data into cash
(Customer Data Monetization)

Use AI to extract and monetize insights from the vast amounts of customer data now being generated by digital systems.

Issue/Opportunity

High-quality customer experiences are a prerequisite for success in the digital era; however, they are extremely data intensive. Traditional analytics platforms are often not sophisticated enough to handle the massive volume and complexity of data from today's connected systems. Without enhanced large-scale data analytics and monetization capabilities, companies can find themselves marginalized or shut out of the best opportunities.

How AI can help

Monetize customer data
Data monetization opportunities using AI vary by product and industry. In the tech industry, for example, Facebook developed an AI-based tool called DeepText that extracts meaning from users' posts by learning to analyze them contextually.[11] The company uses the tool to direct people toward products they seem likely to buy based on the conversations they are having. The company also uses deep neural networks to decide which advertisements to show to which users. The AI-based systems cluster users together in meaningful ways, and then use keywords to match the most relevant ads to the associated group of users.

Create value by combining customer data from multiple sources
Search is Google's primary service offering. However, feeding the company's AI systems with combined data from search and other Google services (such as Gmail, YouTube, and Google maps) can create valuable opportunities for monetization. For example, by linking a search request to other data that hints at the user's intent, Google can provide targeted product offerings that meet the user's needs more effectively in less time.

01
02
03
04
05
06
07
08

Turning customer data into cash
Managing risk and promoting trust

Privacy

Monetizing data through AI insights raises questions about how the data is acquired, whether it was with consent, and the amount of personally identifiable information within it. Consider whether privacy is possible with the envisioned solution, and if there are laws or regulations that apply to how personal data can be used, sold, and shared. Anonymizing data may be insufficient to obscure personal details, even when the insights are used to build an entirely different tool.

Security

In monetizing data, bad actors may see an opportunity to steal the data for their own benefit or corrupt the information to deprive the organization of value. They may do this through attacks such as data poisoning, reverse engineering the code, and exploiting system errors. Trust in the tool and the potential to monetize data requires confidence that AI and data security should be addressed throughout the AI lifecycle and across the technology ecosystem.

Responsible

There have been notable instances of negative public backlash when it is revealed how an organization is using and monetizing personal data. Even if there are no legal restrictions on how data is used, are there ethical limits that should be acknowledged and followed? Every organization sets its own standards for ethics, and AI stakeholders might best consider whether a data monetization solution is in line with the organization's ethical culture.

Possible benefits

Greater business value from customer data.
AI-driven data monetization tools can help companies get the maximum value from their customer data.

Improved decision-making, planning, and collaboration
Those same tools can significantly improve the quality and quantity of insights derived from customer data, streamlining decision-making and planning, and improving data sharing and collaboration between internal and external stakeholders.

Networks that fix themselves

(Self-Healing Networks)

Using AI-based predictive and preemptive maintenance to make networks less failure-prone and more self-healing.

As networks and IT infrastructures grow more complex and unpredictable, they are becoming increasingly failure-prone and costly to maintain. By monitoring and analyzing a wide range of network data (such as connection speed, signal quality, and power consumption), machine learning algorithms can predict when and where network maintenance will be needed—before a failure occurs. They can even predict the exact cell towers or sections of cable that are most likely to fail. These capabilities are already in place for fixed networks, but over the next 3-5 years are expected to reach maturity in radio networks (3G, 4G, 5G) as well. Currently, radio network attributes such as power level and electromagnetic field are manually adjusted several times per year. However, in the future they could be continuously and automatically managed using AI. All these AI-enabled capabilities can help reduce the costs and downtime associated with scheduled maintenance—and the even greater consequences of unexpected failures.

Lingua AI
(Language Translation Services)

Using AI technologies to improve the speed and accuracy of language translation services, essentially making every language the lingua franca.

As networks and IT infrastructures grow more complex and unpredictable, they are becoming increasingly failure-prone and costly to maintain. As the modern world becomes increasingly global and interconnected, overcoming the language barrier becomes more and more essential. Unfortunately, traditional machine-based language translation services cannot deliver the necessary accuracy, relying on simple rules-based approaches and statistical models that are relatively primitive. Enter AI. Natural language processing technologies—in combination with machine learning and deep learning—are already enabling impressive language translation services on our phones and other handheld devices. And as the technologies continue to advance, it may soon be possible for highly accurate language translation to occur on-the-fly in real time—eliminating the need for costly manual translation, and giving humans the ability to freely communicate with each other regardless of what language they speak.

Monetizing video data
(Video Content Analysis)

Using computer vision, machine learning, and deep learning to analyze video content.

AI can help monetize video data by automating the analysis of video content—enabling real-time action, monitoring, and trend reporting. For example, with AI, companies can analyze video data on social media to understand what people are talking about, how they are feeling, and what their preferences are. These insights can then be used to deliver timely, personalized offers and proactively address customer issues before they become problems.

07

Beyond the page
(Audio & Video Mining)

Using AI to mine and monitor audio and video data.

In today's world of smartphones, videos, and social media, a lot of valuable data is being generated in the form of audio and video—not just words and numbers on a page or in a file. AI technologies such as computer vision, voice recognition, and deep learning can be used to convert audio and video content into structured data, and can then help mine that data for key events, such as a consumer posting a product review on social media. In call centers, for example, AI-enabled solutions can transcribe and document video and phone conversations, then mine the resulting data for hidden problems and other clues to help drive improvements in everything from call center operations and employee training to product design and customer loyalty.

Watching the watchers
(Ad analytics using emotion detection)

Using AI and in-room sensors to monitor and analyze exactly how viewers respond to TV ads.

Marketers have a wide range of tools to predict how TV audiences will respond to advertisements. However, AI is taking those capabilities to a whole new level. By installing sensors in a viewer's living room—and then using computer vision and other AI technologies to monitor and analyze the sensor data on a second-by-second basis—marketers can see exactly how an ad is affecting the viewer emotionally. They can also glean other valuable details about viewers, such as their precise demographics, actual viewing habits, and level of engagement with various content. So while it might be true that people can't learn anything from watching TV, apparently AI can learn a lot from watching people watch TV.

The key to success is to start small but think big.

Conclusion

Getting the most value from AI

Although AI adoption rates and maturity levels vary widely across industries—and even within them—there seems to be no question that AI is here to stay. In fact, AI is quickly becoming a competitive necessity for nearly all types of businesses—driving unprecedented levels of efficiency and performance, and making it possible for businesses of every shape and size to do things that simply weren't possible before.

The key to success is to start small but think big. According to a recent Deloitte survey—*State of AI in the Enterprise, 3rd Edition*[12]—74% of businesses surveyed are still in the AI experimentation stage. At times lacking a clear vision of how all the pieces fit together, businesses are focused on modernizing their data for AI and building AI expertise through siloed pilot programs and proofs-of-concept. By contrast, only 26% of businesses surveyed are focused on deploying high impact AI use cases at scale, which is when the real value kicks in.

In this compendium, we've highlighted many of the most compelling and business-ready use cases in every major industry, as well as some of the associated risks and what they mean for trust in the tools. However, no matter how compelling an AI use case might seem on paper, its value can only be unlocked in practice. By understanding and managing the risks and then deploying AI at scale across your broader enterprise and ecosystem, you can strive toward the maximum impact and value from this transformative technology.

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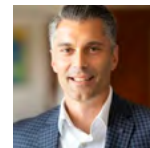
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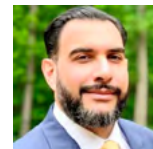
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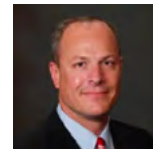
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Acknowledgements

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