



GETTING FROM A TO AI

The Path to Data Analytics Maturity

In a crowded Silicon Valley auditorium, two opponents met on stage to debate. On one side of the stage stood Harish Natarajan, world record-holding debate champion. On the other was [“Miss Debater”](#) — an AI system ready to test the limitations of human cognitive capacity. Each debater was given just 15 minutes to prepare before presenting a four-minute opening statement, a four-minute rebuttal and a two-minute summary.

The human won—this time.

Miss Debater may have gone up against the world's foremost debater and lost, but in a previous competition, the AI won. The idea that a machine can understand, intelligently digest and respond to a nuanced argument in mere minutes is no longer just science fiction.

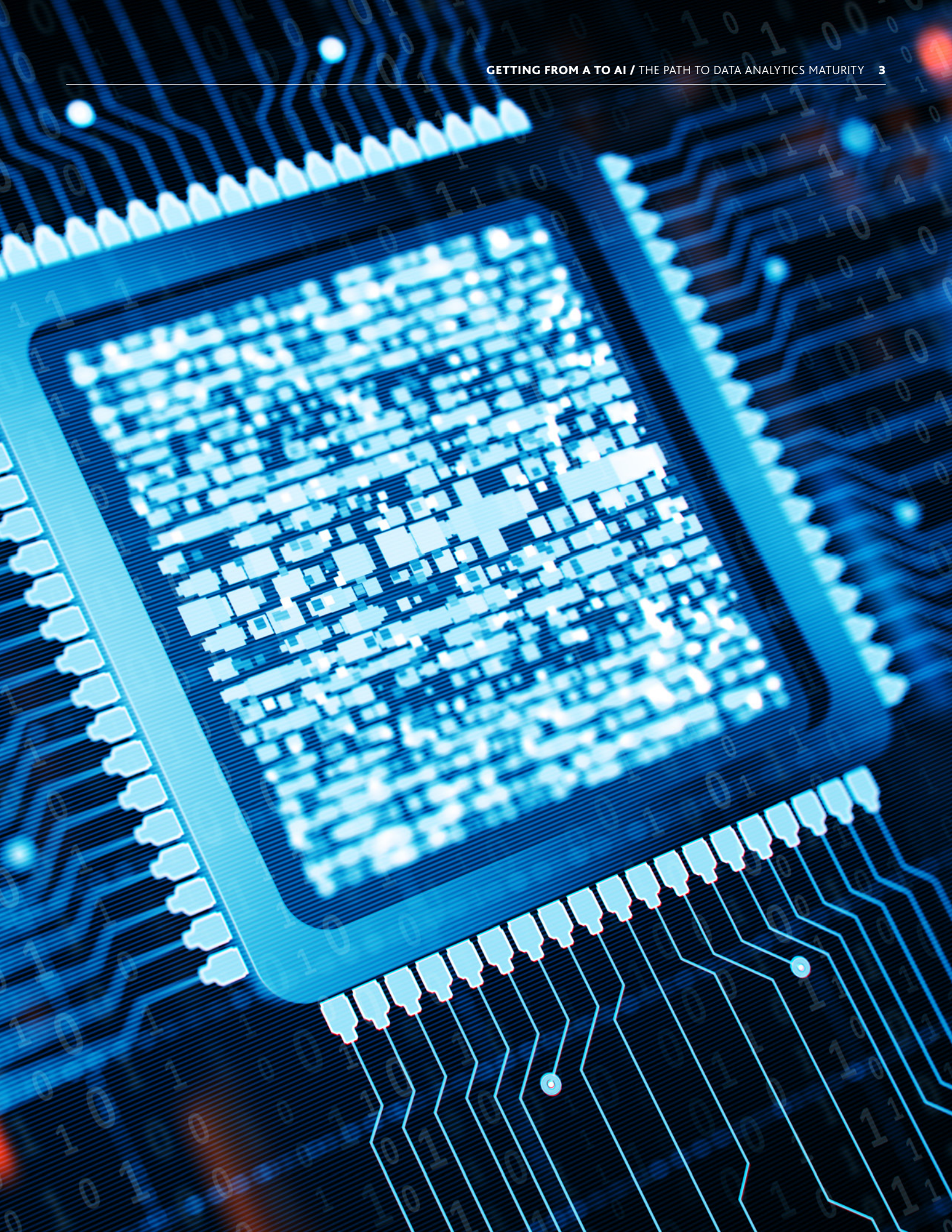
This surreal reality is rapidly unlocking new possibilities across industries—and rewriting the playbook of how companies size up the competition, strategize and do business.

Business intelligence experts and doomsdayers alike have been sounding the alarm on the emergence of Big Data for more than a decade, but just how big is big? According to projections, this year, the entire digital universe is expected to surpass [44 zettabytes](#) (or 44,000,000,000,000,000,000,000 bytes)— which is 44 times more bytes than there are stars in space.

Many middle-market companies are unable to manage this volume of data or extract actionable insights, therefore leaving money on the table.

To compete long-term will require companies to harness the unwieldy power of data and make insight-driven decisions, which can only be accomplished through data analytics maturity.





A IS FOR ANALYTICS AND AI

The relationship between data analytics and AI can seem murky at times. To clarify the distinction, imagine that analytics and AI exist on a spectrum. As we move from the left to the right side of that spectrum, we gain the ability to not only learn from the past, but also predict the future.

On the left side of the spectrum is data analytics. Analytics allow organizations to extract insight from its various data sources, arming workers with takeaways to inform smarter decisions.

On the right side is artificial intelligence (AI). The term is somewhat nebulous; but, as its name describes, AI can most easily be understood as a synthetic reproduction of human cognition.

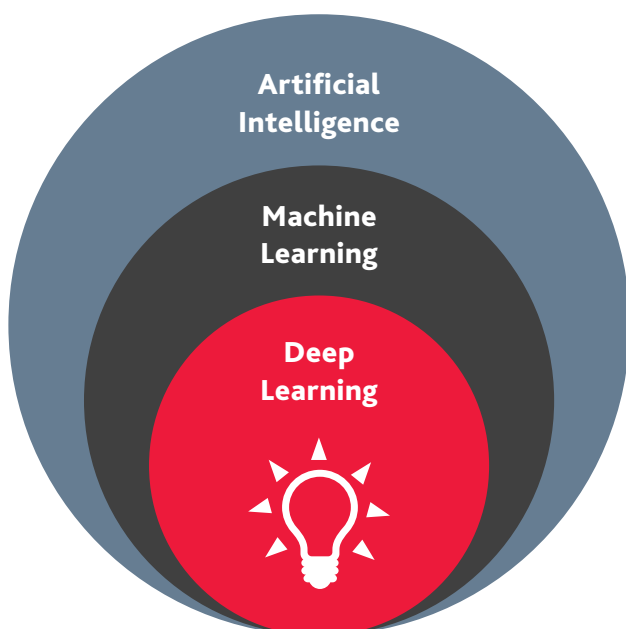
The human brain is powerful because of the problems it can solve, the connections it can draw from past experience to new circumstances and the way it can recognize patterns or the emotion behind someone's eyes. Artificial intelligence, likewise, is neural, cognitive. AI is not a product or an outcome. Rather, AI is an enabler with the uncanny ability to power decision-making throughout every aspect of a business.

Within AI sits Machine Learning (ML), through which algorithms can learn from the data they mine, applying their newfound knowledge to improve performance. Think of the toddler taking in the world around her and learning through observation. As she grows, she is constantly adapting her beliefs.

First the child observes if-then patterns: If she jumps in a puddle, the water splashes around her. As she develops, she learns to perceive and intuit—who to trust, what choices will make her feel fulfilled, how to break patterns and change future outcomes. The human brain experiences the world—and learns from these experiences.

Just as the human brain interprets experiences to inform beliefs and future decisions, with AI it takes an input to create an output; AI must be fed data to deliver. With the right data, AI can enable a business to accomplish the unimaginable.

Take, for example, Libratus, a computer program taught to play no-limit Texas Hold'em at Carnegie Mellon University. At first, the programmers taught the computer the rules of the game using rules-based programming. As the AI played game after game, it deduced additional rules of its own based on patterns it identified. Through these patterns, the system learned that bluffing was key to mastering the game—thus moving along the continuum into the world of AI and ML. The creators of Libratus have much broader applications in mind. It was created to learn new games—and navigate any situation with asymmetric information and “bluffing”—from international diplomacy to business negotiations.



A DATA FOUNDATION → AI MATURITY

The path to AI maturity must start with a sturdy data foundation. The ability of a business to move along the spectrum from data analytics to AI depends on the availability and cleanliness of that data.

Cracks in the data foundation will weaken the structural integrity of everything built upon it—from descriptive insights, to data-backed decision making. Essentially, [insights are only as good as the underlying data on which they are based](#).

A significant portion of enterprise data is either trivial, irrelevant, or cannot be read by the systems in place. Extracting insight from data is often constrained by inconsistent naming conventions, duplicate data and incomplete records.

When data analytics projects die on the vine, the failure can often be attributed to a lack of investment in building a strong data foundation.

Yet, companies cannot allow perfect to become the enemy of good. Every new digital initiative is an opportunity to drive incremental improvement in data management and provisioning, integrating multiple sources of data and edging closer to a single source of the truth. It is a process that takes time and patience but will increase the value a company can extract from its data treasure trove.

With a meticulously laid data foundation, you can ready your organization to operationalize analytics and, ultimately, tap the value of AI.

BDO'S DATA ANALYTICS MATURITY MODEL

Too often, organizations do not know where they stand—or what is next—in the daunting process of fully capitalizing on their data. **The three A's of architecture, analytics and AI** all need to come together to create the technological infrastructure necessary for data analytics maturation.

Beyond these critical technical factors, an organization's ability to fully tap its data hinges on its people. Without attention to leadership, culture and employee upskilling, a company's workforce cannot support the future state of the business.

To help organizations pinpoint their data analytics maturity—and the incremental steps they can take to level up—we have plotted the tell-tale indicators that best signal a company's progress toward building a sophisticated data analytics program.

	1. Interest	2. Inspire	3. Innovate
PEOPLE	<ul style="list-style-type: none"> ▶ Data evangelist builds interest, excitement and energy around the cultural changes that need to happen ▶ Executive or steering committee is focused on data ▶ Begin to educate workforce about the latent power of data in improving day-to-day decision-making, business outcomes and revenue potential 	<ul style="list-style-type: none"> ▶ Begin to inspire data champions ▶ Help staff recognize that they could make more informed business decisions with access to analytics 	<ul style="list-style-type: none"> ▶ Form a team or use an outsourced service to test ROI of using data to innovate within your organization ▶ Engage broader workforce beyond COE to spot applications of data analytics in every role ▶ People at the top of the organization create pathways for self-service applications so employees at all levels can apply their newfound knowledge ▶ Cultural skepticism and fear of analytics still exists within the organization
REQUIRED SKILLS	<ul style="list-style-type: none"> ▶ Business acumen, creativity, analytical thinking ▶ Introductory data visualization and dashboard skills (e.g. Power BI, Tableau) 	<ul style="list-style-type: none"> ▶ Advanced data visualization and dashboard skills (e.g. Power BI, Tableau) 	<ul style="list-style-type: none"> ▶ Cloud data architecture and solution design for scalability ▶ Data engineering and real-time data ingestion skills (e.g. Python, R, SQL, IoT Streaming) ▶ Data modeling and security design for future usability and self-service proliferation
ARCHITECTURE	<ul style="list-style-type: none"> ▶ Begin to take stock of the disparate data sources available across the organization, the existing data sets and their business applications ▶ Start developing long-term data strategy 	<ul style="list-style-type: none"> ▶ Basic information governance principles in place ▶ Ad-hoc system and data integration for specific needs 	<ul style="list-style-type: none"> ▶ Data quality is monitored and sustained through ongoing data maintenance ▶ Established enterprise data model and information architecture ▶ Cloud-based data warehouse or lake for storage
ANALYTICS	<ul style="list-style-type: none"> ▶ Specialized, short-term analytics projects outsourced to third-party provider 	<ul style="list-style-type: none"> ▶ Ad-hoc analytics adoption, primarily reporting applications ▶ Form hypotheses for how specialized data analytics could reduce cost or risk ▶ Begin to derive meaningful insights from data in your proof of concepts 	<ul style="list-style-type: none"> ▶ Insights are pulled into dashboards and shared under strict governance with key stakeholders to inform decision-making
AI			
ROI	<p>Tactical</p> <ul style="list-style-type: none"> ▶ Organization is investing in the groundwork necessary to extract value from data analytics—advancing risk mitigation and cost savings 		<ul style="list-style-type: none"> ▶ Data analytics leads to smarter, data-backed decisions

4. Ingrain

- ▶ Data-backed decision-making is becoming ingrained as a part of the culture of the company
- ▶ Data analytics is not viewed as a black box—distrust begins to dispel
- ▶ Managers role model data-backed decisioning
- ▶ Employees make a conscious effort to use data analytics regularly—view their adoption of analytics as a KPI of their performance

5. Implied

- ▶ Everyone within the organization is applying data within their role; it's implied that all decisions are data-backed
- ▶ Data analytics is trusted, even when it debunks long-held beliefs
- ▶ Employees view themselves as the teachers and shepherds of the data—to teach the models, spot shortcomings, insert human judgement and ensure morality

- ▶ RPA and Automation
- ▶ Data science, machine learning

- ▶ Cognitive AI, automated AI development, augmented reality, intelligent automation
- ▶ Industry expertise to apply advanced analytics to core business value proposition

- ▶ Reference architecture is understood and increasingly used throughout the organization
- ▶ Beginning to leverage RPA to automate basic data management processes

- ▶ Architecture allows for easy integration with third-party data sources and applications
- ▶ Automation of data integration and creation of autonomous databases

- ▶ Operationalized analytics inform company-wide decision-making
- ▶ Deployment of advanced analytics, including forecasting and predictive models

- ▶ Adoption of machine learning and deep learning algorithms

- ▶ Consider ROI analyses at the front of each initiative
- ▶ AI projects have a strong business case with real impact on the bottom line

- ▶ AI is ingrained in commercial products, improving bottom line, saving money and boosting profitability
- ▶ AI has essentially disappeared into the fabric of the organization and is a foundational component of day-to-day business

Strategic

- ▶ Data is fully monetized through partnerships, integrations, new revenue streams, and product offerings
- ▶ ROI gets more compelling with the use of foresight to predict challenges before they happen
- ▶ Human capital used more efficiently thanks to less manual work



Organizations would be wise to start good data management habits now, being mindful of the value they hope to derive from analytics in the future. Eventually, every business process—from core operational processes like customer acquisition, to management processes like risk management and support processes like accounting—should be data-driven, with analytics embedded throughout. The journey to operationalizing analytics across the enterprise may start small, with ad-hoc adoption of analytics in dashboards and reporting, paving the way for more sophisticated analytics tools and business intelligence.





WHERE ORGANIZATIONS GO WRONG

Successfully reaching data analytics maturity can best be attributed to getting the right data into the right hands with the right business case. Most failures occur in low to mid-maturity levels (1 - Interest, 2 - Inspire, 3 - Innovate), before analytics have fully permeated every aspect of the business—and while doubts and discomfort can weaken employee adoption.

These factors can make or break a successful data analytics program.

1. Getting the right data...

Garbage in, garbage out: Data must be refined, cleaned and governed to set the right foundation. A centralized data strategy and scalable architecture to support the future state of the program is essential.

Only with the right data foundation can businesses derive visibility into: **what happened** (descriptive analytics), **why it happened** (diagnostic analytics), **what is going to happen** (predictive analytics) and **what to do** (prescriptive analytics)—eventually predicting future challenges and how to navigate them.



Taking it one step further, with cognitive analytics, a machine can learn from experience and generate its own hypotheses, drawing connections from a wide range of data by reaching beyond the constraints of human thinking.

2...Into the right hands

Once a company puts the right data infrastructure and technologies in place, the question remains: Will the workforce embrace or resist it?

It is critical that the data evangelist who champions the data analytics program has the organizational clout and authority to inspire others. Sometimes data is owned by a siloed part of the business, without the ear of leadership or a seat on the management team. Ultimately, the programs championed from the very top of the organization will mature the quickest, meeting the least resistance.

Once a well-regarded leader has taken up the cause, the next step is to work toward building a workforce of the future through talent development programs that upskill workers to leverage data in every corner of the business. Employees must trust in the validity of data-derived insights. The best way to instill this trust is by transparently educating employees on the inputs that inform data-backed decisions.

3...With the right business case

Reaching data analytics maturity requires investment in people, process and technology.

Clearly stating potential ROI from the onset of the project is critical to help leadership and employees across the organization recognize the value in proceeding. Starting small goes a long way. Begin with proofs of concept, generating internal success stories that fuel enthusiasm, adoption and continued investment.

WHAT IS A DATA STRATEGY?

A data strategy sets a common vision to align data with current and future business objectives. Steps in a data strategy include:

- ▶ Build executive buy-in on a vision that emphasizes data assets as critical to a company's success. Companies that leverage data as an asset can strategize ways to increase revenue or decrease risks by implementing data analytics across critical business functions from operations, to sales and compliance.
- ▶ Examine the current data ecosystem; evaluate whether to evolve, re-platform or build from scratch a scalable data analytics architecture.
- ▶ Establish a standard syntax or "data glossary" for cataloguing structured and unstructured data (i.e., metadata).
- ▶ Institute rules and policies for how data is accessed, stored, retained and disposed.
- ▶ Set metrics for assessing the quality and usability of data assets.
- ▶ Diagram current data flows tracking data lineage.
- ▶ Have a clear understanding of current and future data analytics use cases.
- ▶ Develop an adaptable data reference architecture.
- ▶ Take stock of human capital resources, including current analytics capabilities and roles. Conduct a gap analysis to build the right future team to evolve analytics maturity.
- ▶ Determine data storage needs to facilitate information-sharing and data integration.
- ▶ Build predefined models for self-service analytics and AI.





MAN VS. MACHINE: HOW AI WILL CHANGE THE WORKFORCE

Hollywood and science fiction's portrayal of AI often leave employees in fear that they will be replaced by robots. While this fear is not entirely unfounded, it does require tempering.

The AI available today falls short in many of the ways human thinking excels: AI is not good at emotion, metaphor, sentiment or morality. Rather, machines require context, interpretation and oversight—all which need a live workforce.

One well-known example is Amazon's resume rater, which gave each job candidate a star-rating after mining submitted resumes over a 10-year period. The machine learning technology was shut down once leadership discovered that the algorithm learned implicit bias against women. Without intervention, machine learning technology will encode the biases pervasive in the human behavior it replicates.

While the original vision of AI was to mirror human decision-making, AI cannot and should not render a human workforce redundant. In the immediate future, machines have the most potential to augment humans to make people work smarter.

Make no mistake: AI will transform the way we work.

1. Easily automated tasks will be tackled using intelligent automation.

Where there is paper, manual tasks and complex workflow steps, there is rich opportunity to inject automation to improve accuracy, shorten processes from days to minutes and dramatically improve business performance. One such task will be the collection and organization of data, which will no longer be managed by humans.

2. There will be less need for Data Scientists.

It used to be that in order to bring data analytics and AI to a business, you needed to hire a data science team to gather, clean and collate data, and teach the system how to use it.

Today, as open-source engines become available, service businesses are emerging that make it easier for organizations to do data science without data scientists. As software becomes smarter and more pliable, businesses will not have to reconfigure around the software. Rather, the software will adapt to fit the business.

3. AI will inform the decisions made in every role, in every department.

As this transformation takes place, two types of future roles will emerge:

- ▶ **Data Proctors:** These employees will serve as subject matter experts that teach machines to enable higher level learning and better application of knowledge.
- ▶ **Data Deciders:** When a condition arises and there needs to be a human intervention, these employees will step in.

TYPES OF AI & THEIR ROLE IN THE WORKPLACE

Narrow AI	General AI	Super AI
<ul style="list-style-type: none"> ▶ Can't replace human capital, but makes your workforce more efficient by providing a specific service or handling a discrete task ▶ Can make humans more efficient by taking on part of their automatable workload ▶ Feasible in today's workplace 	<ul style="list-style-type: none"> ▶ Equivalent to a human brain, only faster and more accurate ▶ This was the original vision of AI and may be where we are headed 	<ul style="list-style-type: none"> ▶ More powerful than the human brain; considers every possibility, draws more connections than the human mind can; clearly superior in every function a human mind can do ▶ Unlike anything we've seen—this may be in the distant future or never come to fruition

Illustrative Applications in the Auto Industry

AI Powers Self-Driving Vehicles

A Narrow AI application could be using autonomous driving technologies in the vehicles themselves, helping the driver get from A to B more safely.

Self-driving technology uses sensors to map surroundings and plot the car on this virtual map. Alerts tell the driver as they drift or get too close to another vehicle. Automatic emergency braking anticipates a collision and takes corrective action to prevent an accident.

AI as the Car Salesperson

In a car dealership of the future, General AI technology could be used in lieu of a car salesman.

The AI would be able to help individuals find the model that best aligns with their preferences, upsell features and add-ons and even handle negotiating price and financing the vehicle.

AI in the C-Suite

Finally, imagine Super AI powering the auto company finances.

Perhaps a Super AI CFO can navigate tax filings to optimize company financials and maximize workforce efficiency by reallocating staff fluidly based on ever-changing company needs.

This Super AI CFO would be smarter than any human CFO ever could be—ensuring the company continuously captures more market-share and beats out the competition.

WHAT IS POSSIBLE WITH MATURITY?

When correctly leveraged, a mature data analytics program will save businesses time, reduce risk and boost financial return. Consider the following advantages of mature data analytics initiatives in action:



Create New Revenue Streams

A parking lot operator was able to unlock a new revenue stream by employing a computer vision model to track open parking spaces at a mall. The cameras identified the make and model of arriving vehicles—feeding that data to the mall for highly targeted advertising powered by machine learning. Based on this information, arriving shoppers received promotions within their vehicle or on their mobile phones.



Detect Fraud

A healthcare company used deep learning to review their accounts payable records to ensure there were no errors. Through this audit, they spotted one vendor and one year that stood out as abnormal. The invoice line and invoice header did not add up, all to the tune of \$13M dollars. Through deep learning the company was able to find the unexpected without humans having to tell the machine exactly what to look for. In contrast, it can be challenging for humans to sniff out fraud and identify outliers.



Spot System Breakdowns

A manufacturer was having issues in their plant with a product that would get to the end of the line and then fail their quality testing. To figure out the issue on the manufacturing floor, they leveraged deep learning to spot anomalies. First, they pulled all the data from their sensors and used deep learning to discover the culprit. The manufacturer uncovered that one worker on the manufacturing floor was doing something different than everyone else. As it turned out, this person was the only worker following instructions to a T—which were out of date and needed to be updated.



Curb Costs

A logistics company was perplexed to see that cargo ships taking the same route sometimes used more fuel than others—driving up costs. By using deep learning, they discovered that at a particular point in the ocean, some ships appeared to stall as they lost radar connection for 12 minutes. The ships that went off autopilot for these 12 minutes would drift and then need get back on the route. Through deep learning the company was able to predict when this would happen and recommend that ships go on manual at that point in the ocean.

WHY NOW?

Regardless of where your organization sits today, future-proofing your business depends on laying the groundwork for data analytics maturity. Your competition may not currently have the sophistication to anticipate the hazards that could derail profits or drive new revenue streams using customer data.

But in the proverbial data arms race, there will be limited survivors. By starting now, you can ensure that your most valuable asset—your data—is put to use to edge out the competition.



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