

Machine learning— driven analytics: Key to digital transformation

Maturing technologies are turning data into
actionable intelligence—and competitive advantage



A briefing paper in association with

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Whether you're a telecom provider, an auto manufacturer, a health-care organization, or a retailer, if you're not yet using artificial intelligence (AI), you—and your competition—soon will be.

Companies in every industry are awash in data; now, the challenge is transforming the deluge of data into intelligence that drives competitive advantage and smarter day-to-day business. By 2021, in fact, Gartner projects that 40 percent of all new enterprise applications implemented by service providers will include AI technologies. And while AI is working its way into many software types, (see figure 2, page 6) from chatbots to security systems, a game-changing area for its use will be big data analytics.

The use of analytics and AI is rapidly expanding, powering the personalized experiences contemporary consumers and business users demand. Taking the methodical approach (see “Best practices for simplifying your digital transformation,” page 5) can help organizations quickly and effectively realize the benefits of AI related to transforming traditional business intelligence (BI) and analytics.

We are in the throes of the digital economy, where both the volume and the sources of data are proliferating at an exponential rate – from consumer

devices, appliances, cars, and industrial assets to the Internet of Things (IoT) – and the list keeps growing.

Big data has simply become bigger than what human workers can handle on their own, particularly with global data stores. According to IDC, companies will be storing more than 100 trillion gigabytes of data by 2025 – 10 times the amount created in 2016. With all that data, organizations now realize they not only can discover more about consumers, patients, markets, machinery, and anything else that generates data, but they also can predict their behavior. Further, they can take actions that change outcomes for the better, whether reducing customer churn, finding cost efficiencies, or improving diagnosis accuracy.

Suffice it to say that data by itself does not hold much value unless enterprises can harness it to derive real-time, anywhere/anytime insights regardless of where that data resides – whether at the edge, in the cloud, or on premises. Enterprises that will survive and thrive in this digital economy are those that have a pervasive strategy in place across data, analytics, and AI – the three interconnected categories of technology, along with infrastructure, that are fueling digital transformation. Key to this transformation will be the use of autonomous analytics and machine learning (ML), enabling enterprises to drive greater automation of tasks and derive insights at breakneck speed.

“Instead of looking at just enough data to support a hypothesis, machine learning does inductive discovery—it looks at what the data is telling me, even things I didn't think about.”

Rich Clayton, vice president of product strategy, Oracle Analytics



AI and machine learning accelerate actionable insights

Traditional business analytics required heavy IT involvement and generated lots of data points that were difficult for average users to navigate or contextualize. With AI-driven analytics, businesses can automate data preparation and reveal hidden patterns through smart data discovery and

interactive exploration. At the same time, predictive and prescriptive analytics are enabling business users to foresee outcomes, allowing them to proactively seize opportunities rather than waiting to react.

Gartner predicts that natural language generation and AI capabilities will be standard fare in 90 percent of modern analytics platforms by 2020, and that at least half of analytic queries will be generated or automated using those technologies in the same time frame.

The result will be simplified and more personalized insights that anticipate requirements and make recommendations using predictive analytics. Users can conduct searches using familiar terms, and the software will query the optimal data sources and contextualize results using visualization tools. Instead of users telling the software what they are looking to find, autonomous capabilities serve up insights based on identified correlations and patterns – evolving and anticipating future questions based on self-learning.

Businesses can leverage AI tools and



Key takeaway

Successful digital transformation builds on the modernization of the underlying data infrastructure combined with a clear strategy for data, analytics, and AI. Only those enterprises with a vision for intelligent, autonomous analytics will grow beyond decision making that drives efficiency and productivity to an innovation agenda geared to competitive advantage.

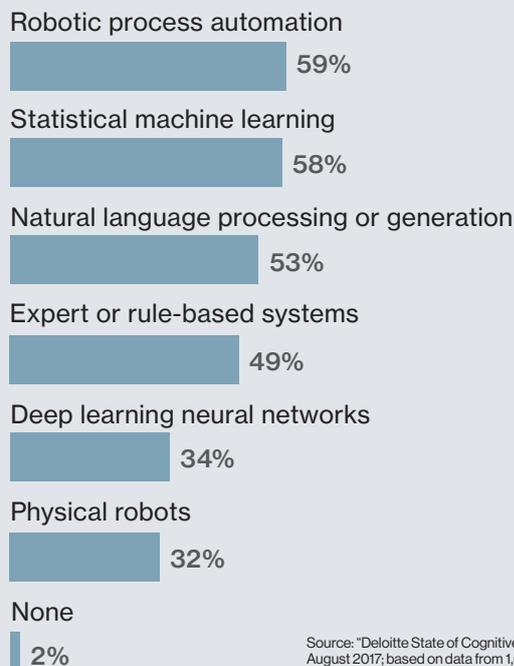
techniques, particularly machine-learning algorithms, to accelerate insights. In development for many years, machine-learning algorithms can “learn” over time through data, progressively developing the ability to discover hidden patterns and make predictions. Machine learning is an empirically driven sub-field of AI with roots in statistical modeling. It enables systems to learn and improve following repeated exposure to data without being programmed explicitly.

Rather than eliciting knowledge from human domain experts to be expressed as software “rules,” models are “trained” from carefully prepared data sets that pair inputs with expected outputs. For example, while traditional software development excels at capturing rules we can express explicitly – say, calculating sales tax – most human expertise is implicit, based on experience: we can make a judgment call or a diagnosis, but, except in the simplest cases, we can’t present the kind of detailed “workings” that would have satisfied our high school math teacher. By inferring important relations directly from the data, machine-learning methods routinely attain human or above-human performances on new examples not seen during the training process, effectively substituting a kind of “experience” for hand-coded rules.

Machine learning allows companies to use software to address problems that traditional coding could not. “Machine learning is not some obscure magic that happens with data scientists in a back room – it’s pervasive in how we use and consume information,” says Rich Clayton, vice president of product strategy for Oracle Analytics. “Instead of looking at just enough data to support

FIGURE 1

Types of AI in use today



Source: “Deloitte State of Cognitive Survey,” August 2017, based on data from 1,500 senior executives from the United States

a hypothesis, machine learning does inductive discovery – it looks at what the data is telling me, even things I didn't think about.”

The use of machine learning across verticals is becoming increasingly pervasive and an integral part of digital transformation. Deloitte predicted large and medium-sized businesses will “intensify their use of machine learning” in 2018. The number of implementations and pilot projects using ML will double, and this accelerated adoption will continue well into 2020 (see figure 1, page 3).

For example, telecom providers can feed ML algorithms with a multitude of data points on actual customer behavior (such as usage, call center history, response to promotions) to predict which customers are at the highest risk of churn. In retail, companies are leveraging machine learning and autonomous analytics to derive real-time customer insights that enable retailers to deliver targeted and contextually relevant offers and customer experiences. Financial firms are leveraging machine learning in a host of applications from algorithmic trading and customer service chatbots through to real-time fraud prevention. Health-care and biotech companies are driving innovation in genome research and precision medicine designed to improve patient care, formulate new therapies, and streamline operations.



ML and autonomous analytics are key to digital transformation success

Digital transformation requires the use of both adaptive and autonomous analytics. This means using machine learning to power the business analytics value chain starts with discovery, moves to preparing and augmenting data, and then to analysis, modeling, and finally prediction. ML capabilities have historically been out of reach, both cost and talent wise, for most organizations. Additionally, businesses cannot compete based on outdated infrastructures. “To drive successful digital transformation, enterprises will need an optimized stack of technology – from hardware and storage to software and applications that leverage machine-

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Sandeep Togrikar,
analytics solutions architect, Intel

learning techniques – all designed to run analytics and AI applications seamlessly in any environment,” says Sandeep Togrikar, an analytics solutions architect at Intel.

Modern analytics platforms infused with machine learning and natural language processing eliminate the need for much of the up-front technical work, automating data preparation and facilitating smart data discovery via interactive visual exploration. With cloud-based intelligent, autonomous analytics and the advancement of relatively low-cost, high-capacity compute power, storage, networking, and new memory technologies, businesses can realize a step change in the speed and sophistication of their data-driven insights.



It's no longer just business analytics

Here is an example of a real-world application of AI from the California Department of Conservation.

With more than 100 years' worth of data, much of it paper-based, the agency wanted to increase its data-driven decision making. However, it lacked experience and expertise with technology and analytics. By adopting a cloud-based, autonomous analytics system, the department aggregated its disparate data sources and obtained insights in weeks; doing so would have otherwise taken years – if researchers had even thought to ask the questions. After analyzing oil and gas production across 250,000 wells throughout the state, for example, the organization discovered anomalies on 30 percent of all wells in the first 30 days of deployment.

Another example is Toyota Motor Corporation's use of cloud-based intelligent analytics to analyze the usage trends of its Ha:mo RIDE, an ultra-small mobility-sharing service. Using data analytics and visualization, the automaker can detect patterns in scattered data, optimizing the service's effectiveness in connecting personal and public transportation.

With modern analytics platforms infused with ML and natural language features, organizations can also share data with a wider range of business users, partners, and customers. The U.K. National Health Service (NHS) Business Services Authority, for example, which serves the country's 53 million residents, is on track to save more than \$1 billion by the end of 2018 by consolidating its data, with the goal of reconciling the costs and identifying patient care improvements.

“By consolidating its data on Oracle Exadata Cloud Service, then analyzing it with embedded analytics and Oracle Analytics Cloud, the NHS can drill down into billions of data points on the agency's health-care providers, their patients, and the effectiveness of prescriptions and treatments,” says Nina Monckton, chief insight officer of the NHS Business Services Authority.

As illustrated by these early examples, developing an AI-driven analytics capacity gives companies a competitive edge.

“The explosion of data and new machine learning–enabled business analytics lets us move the curve – instead of operational reporting and post-mortem analysis, you are able to predict events and take forward-looking actions,” explains Intel's Togrikar.

Best practices for simplifying your digital transformation

To optimize their investment, businesses need to develop a strategy that embraces AI advancements and ensures scalable processing power that can handle machine-learning algorithms and high data volumes. But it's not all about technology. Best practices span organizational and technical issues, requiring organizations to do the following:

- **Formulate a holistic and long-term data strategy, not just a tactical road map for disparate projects.** Doing so requires an assessment of business objectives along with a clear definition of success criteria and the data maturity of the enterprise. Evaluate such variables as existing legacy applications, workload placement, agility and time to market, security, compliance, capacity, legal/regulatory requirements, workforce skills, and maturity of offerings from cloud solutions providers.
- **Identify use cases with high return on investment (ROI) that are tied to business goals and objectives, which will help demonstrate initial proof points and benefits.** An important part of this exercise is to identify the foundational data that will drive such use cases.
- **Capture key lessons learned and make them available for future endeavors.**
- **Allocate enough resources to change management, which is perhaps the most difficult aspect of supporting a data-driven culture.** Make data governance and lineage a top priority along with executive sponsorship – both are critical for fostering trust in the data and any prescriptive actions that might be counterintuitive or beyond the scope of traditional activity.
- **Cultivate talent in new areas like data science – encompassing AI, including machine and deep learning, as well as predictive modeling.** Strive for IT and business teams to remain aligned, and calibrate expectations so stakeholders remain engaged.



The path forward

Data silos and a disjointed approach to analytics have created gridlock, preventing organizations from fully harnessing the power of intelligent insights. Says Oracle's Clayton, "If we continue with the same analytical processes and technology with big data, we won't be able to reap the full potential."

The path to digital transformation success will require the modernization of the underlying data infrastructure tightly coupled with a well-defined strategy for data, analytics, and AI – the three are intrinsically linked. To handle new applications that live both at the edge (such as devices and sensors) and in the cloud, or to run workloads seamlessly across the edge, in the cloud, and on premises, the need to democratize insights will be greater than ever. Providing greater access to actionable information has become the new business imperative for organizations that aspire to win in the digital economy. Those enterprises with a vision for intelligent, autonomous analytics will experience a significant increase in the types of business problems they can tackle, moving beyond decision making that drives efficiency and productivity to an innovation agenda tuned to competitive advantage.

FIGURE 2

By 2021 the number of users of modern BI and analytics platforms with smart data discovery capabilities will grow at twice the rate of users of other platforms, and will deliver twice the business value.

By 2020 half of analytic queries will be generated using search, natural language processing or voice, or will be autogenerated.

By 2020 organizations that offer users access to a curated catalog of internal and external data will realize twice the business value from analytics investments than those that don't.

Source: Gartner's "Critical Capabilities for Business Intelligence and Analytics Platforms," March 2017; based on several sources, including an online survey of vendors' reference customers yielding 1,931 responses

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