

# ARTIFICIAL INTELLIGENCE, ANALYTICS AND MACHINE LEARNING ARE THE FUTURE OF COMMUNICATIONS

Oracle's portfolio of integrated communications and cloud solutions is helping companies thrive in the Digital World.

DIGITAL SERVICE PROVIDERS ARE SEEING A FUTURE WHERE ARTIFICIAL INTELLIGENCE, ANALYTICS AND MACHINE LEARNING ARE RE INVENTING THE CUSTOMER EXPERIENCE, CREATING NEW DIGITAL BUSINESS MODELS, UNLEASHING THE POTENTIAL OF THE INTERNET OF THINGS, AND EVOLVING NETWORKS.

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## ARTIFICIAL INTELLIGENCE, ANALYTICS AND MACHINE LEARNING ARE THE NEXT FRONTIER IN A DIGITAL WORLD

Successful digital service providers will be those that are able to gain insights the fastest and take appropriate action across three key pillars – customer experience, digital business and network evolution. This will require the application of artificial Intelligence (AI), predictive analytics and machine learning (ML) to vast amounts of data on premises and in the cloud. Why? Because the flood of data that comes from smart phones, videos, the Internet of Things (IoT) devices and digital transformation initiatives have limited value without AI technologies that are capable of finding valuable insights in the data and acting on it. Some estimates suggest that the amount of data globally is doubling every two years and this data deluge is bound to continue. For example, smart self-driving cars, which collect environmental data to improve driving destination accuracy and safety, are estimated to create 4 terabytes of data per car every day.<sup>1</sup>

According to IDC, 40 percent of digital transformation initiatives and 100 percent of IoT initiatives will be supported by AI capabilities by 2019.<sup>2</sup> In a recent survey of 60 Fortune 1000 companies, 93 percent of executives identified AI as the disruptive technology their company is investing in for the future because they now have access to the significant amount of data needed for AI to detect meaningful patterns and understand behaviors.<sup>3</sup> The cloud, with its massive data storage capacity and compute power, is enabling the broad adoption of AI and ML across industries today.

In its most basic sense, Artificial Intelligence is the ability of machines to make decisions based on observation and experience, including visual perception, speech recognition, decision making, and language translation. Machine learning is a branch of AI that enables computers to self-learn from data using advanced algorithms, understand patterns in large data sets, make predictions as they encounter new data using pattern recognition, and adapt independently. Some examples include smart cars, speech and facial recognition, fraud detection and prevention, customer segmentation, and network traffic predictions.

AI is bringing about the next wave of the data journey as service providers evolve from a manual, process-centric data approach of dashboards, business applications and data stores to an automated, data-driven approach using prescriptive and predictive analytics, and finally to an autonomous, AI- and ML-driven approach as shown in Figure 1. In an AI-centric organization, autonomous capabilities will include cloud-based systems that are self-driving, self-securing, and self-repairing.

**“AI has the power to completely transform the communications market across customer experience, digital business and network evolution”**

**Doug Suriano**

*Senior Vice President and  
General Manager  
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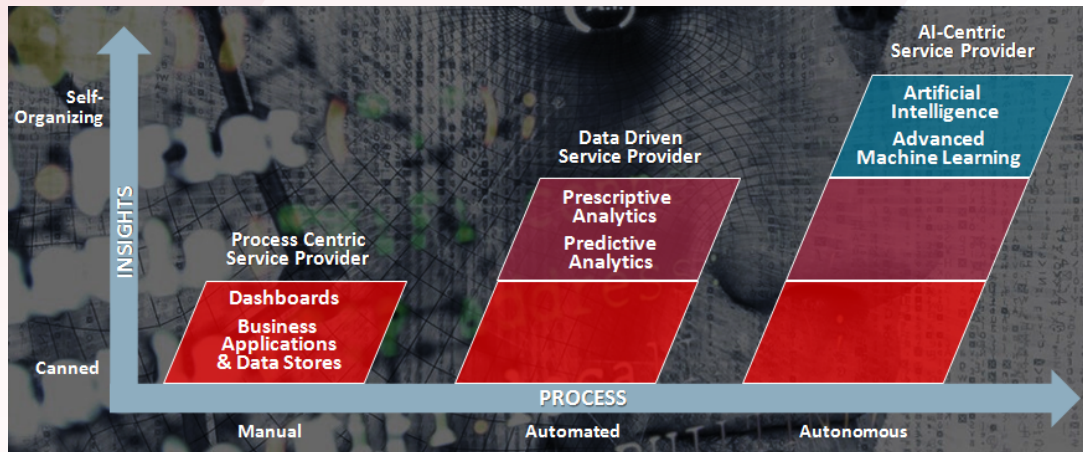


Figure 1. The Inter-relationships among Artificial Intelligence, Machine Learning and Analytics

## EXTEND YOUR COMPETITIVE ADVANTAGE WITH AI AND ML IN THE CLOUD

As digital service providers begin to understand the vast potential of their data, the question they face is: how does our business make the most of it? The answer lies in getting real-time insights from AI across the three key pillars of digital transformation including:

- **Enabling better customer experiences** – 85 percent of customer interactions will be driven by chatbots by 2020 as businesses automate and personalize customer service, intelligently route inquiries and act on buying intent;<sup>4</sup>
- **Accelerating digital business** – by 2025, AI is predicted to generate more than \$3.5B in revenues for the telecommunications, media and entertainment industry from new applications and services;<sup>5</sup>
- **Evolving and improving networks, security and smart phones** – including predictive maintenance, managing exponential growth in connected devices, users and traffic, network optimization, fraud detection and new smart phone applications such as predictive text, route suggestions, voice assistance, translation apps and more.

Today, 63.5 percent of telecommunications organizations are making new technology investments for AI systems.<sup>6</sup> As service providers begin implementing AI, they should keep these key considerations in mind:

<sup>1</sup> <https://venturebeat.com/2017/06/09/ais-37-billion-market-is-creating-new-industries/>

<sup>2</sup> <https://www.mis-asia.com/resource/applications/will-2017-be-the-year-of-ai/>, IDC FutureScapes, 2017.

<sup>3</sup> NewVantage Partners annual executive survey, January 2018.

<sup>4</sup> Gartner Predicts, <https://financedigest.com/ai-will-power-95-of-customer-interactions-by-2025.html>

<sup>5</sup> Tractica, <https://www.scribd.com/document/355209222/23-1-AI-for-Enterprise-Opportunities-Infographics>, 2017.

<sup>6</sup> IDC, [idc.com/getdoc.jsp?containerId=prUS41888916](https://www.idc.com/getdoc.jsp?containerId=prUS41888916), 2017.

- **More data is better.** Data is the currency of the digital economy. Digital service providers are uniquely rich in contextual data—both structured and unstructured, and derived from services, social channels, business, and third-party sources. A coordinated data strategy that includes collecting, analyzing, distributing, securing, monetizing and applying AI/ML techniques to data is critical. Unseen and untapped patterns of human, operational, and system activities with strong, predictive ties to key business results are everywhere. Machine learning will uncover these patterns to deliver significant benefits for all business functions.
- **Recommendations from new AI systems must be easily understood.** They should not require specialized skills sets to decipher because decisions require context and often impact multiple departments and functions.
- **Service providers must have an AI command-and-control center** to ensure human oversight and create a traceable audit trail.
- **AI should initially be applied to data in existing systems and applications.** Evolving current analytics systems using a cloud-based approach and applying AI and ML to data is an effective way to move forward.

AI and ML offer numerous benefits to digital companies. According to the 2017 Economist Intelligence Unit report, [Artificial Intelligence in the Real World](#), 27 percent of more than 200 business executives surveyed say introducing AI to business will improve decision making; 26 percent believe it will improve customer service; 29 percent say it will improve operating efficiency; and 17 percent say it will increase sales revenue. Are you ready? Table 1 shows some of the key requirements service providers should consider as part of a successful AI and ML Strategy,

**Table 1: Are you Ready?**

	AI AND ML REQUIREMENTS
Large-Scale Data Management	AI and ML require storage and processing of vast amounts of data, along with capabilities that encompass data aggregation from a variety of sources including structured and unstructured data, data ingestion, data cleansing and normalization, and data enrichment with business-specific context.
Domain-Specific Knowledge	For AI and ML to deliver their promised value, domain-specific knowledge and data must be applied to the models. Trained, domain-specific models enhanced with firm-specific configurations and pre-integrated in purpose-built SaaS applications or platform services should be provided as an option.
Development Complexity	Service providers engaged in building their own ML models are confronted with complexities in setting up the environment for data ingestion, the storage and high-performance compute infrastructure for training, and setting up the preferred ML frameworks and development tools. They must then ensure that the environment is regularly updated with the latest versions of tools and the latest generation of high-performance compute resources.

## AI AND ML PRIORITIES FOR A SUCCESSFUL DIGITAL TRANSFORMATION

### Priority #1: Deliver Exceptional Customer Experiences

A top digital transformation priority is delivering a superior customer experience. AI and ML combined with advanced analytics will allow service providers to surprise, connect, and communicate with customers in new and innovative ways. This includes the automation of everything from customer communications and content generation to personalized services and adaptive customer journeys. AI will drive 95 percent of all customer interactions by 2025, with consumers unable to differentiate bots from human workers via online chats and over the phone.<sup>7</sup>

In the communications industry, digital service providers need to deal with vast amounts of user data with mobile data traffic forecasted to grow from 14 to 110 exabytes per month between 2017 and 2023.<sup>8</sup> AI, ML and analytics are critical in extracting real-time customer insights from data feeds, applications, and, customer care engagements.

Below are some of the ways that businesses can improve customer experience with AI, ML, and analytics:

- **Intelligent customer engagement:** Digital service providers are transforming traditional contact centers into cutting-edge, cloud-based “live experience” centers with easy to implement software-as-a-service solutions. By combining this with intelligent chatbots that can understand the full context of what an inbound question or comment really means using AI algorithms that analyze vast amounts of customer data and natural language processing, the experience can be taken to a whole new level. AI analytics can help contact centers optimize the use of chatbots and live agent services across web, mobile and contact center channels, and help customers with billing, new devices, troubleshooting, and personalizing offers on the spot to prevent churn (see Table 2). They can also combine historic and behavioral patterns with ongoing real-time engagement data such as emotion recognition to determine the best action at the best moment of the customer journey. The result? Suggestions and offers that are personalized and relevant.
- **AI-infused applications:** Applications that adapt and learn according to the data they process will provide the customer insights needed to make better decisions across the business. Initial adaptive intelligent applications will be aimed at helping customer experience professionals run personalized marketing campaigns in the context of offers and actions that the system recommends for individual consumers. They will also be helpful for fraud detection across customer accounts.
- **Strategic use of application interfaces:** By using APIs to feed into broader AI and analytics cloud systems, organizations can integrate CRM, ERP, sales, marketing, social media, product and revenue data to provide insights into the entire business from concept to cash to care.

“AI is on the verge of broad adoption, and customer experience will be at the forefront of this digital



<sup>7</sup> Servion, <https://financedigest.com/ai-will-power-95-of-customer-interactions-by-2025.html>, 2017.

<sup>8</sup> Ericsson Mobility Report, November, 2017.

transformation through the use of intelligent chatbots. With AI algorithms running in the background, bots can decide what offers to provide to customers that have the best chance of increasing revenue.”

**Doug Suriano**  
Senior Vice President and General Manager  
Oracle Communications

**Table 2: Key Use Cases where Chatbots Add Value**

CONTACT CENTER CHALLENGE	IMPACT ON CONTACT CENTER	HOW CHATBOTS ADD VALUE
Customers still relying on legacy channels to reach contact center	Channels not well integrated, with poor forms of self-service that slow down the process and put more demands on live agents	By delivering better self-service options, chatbots can help migrate customers to digital channels to both improve CX and the use of contact center resources
Consumers are now multi-channel, and can engage across many endpoints – smart phone, landline, PC, Echo, etc.	Limited ability to support all these channels with existing technology, as well as providing a consistent CX across them	If developed to support multi-channel, chatbots can provide better self-service, regardless of channel used by customer
When customers shift from self-service to live agents, CX is usually poor and feels disjointed	Legacy systems provide no context when handing off to agents, so time is wasted repeating everything, driving costs up and customers away	AI capabilities for chatbots can provide continuous context, so agents can seamlessly continue the session as it shifts over from self-service
Improving overall CX and meeting expectations of today’s customers	Legacy systems constrain ability of agents to meet these expectations and get beyond IVR for self-service	Chatbots can help provide faster answers to improve CX, and they are always learning, so can keep pace with changing needs

## Priority #2: Grow Digital Business Revenues

New ‘as-a-service’ digital business models hinge on AI and ML to analyze the large amounts of data required for mass personalization at scale. Advanced Internet of Things services also depend on AI and ML to enable real-time responses to events, post-event processing, and predictive analytics.

Digital service providers can grow digital revenues using AI, ML, and analytics in many ways:

- **AI-based commercial strategy development:** This includes generating ideas for new digital products and services, identifying and analyzing market, demographic and geographic trends, supporting operations decision making, and predicting future trends. AI and ML will help in customer profiling and analyzing offer conversion rates, billing and revenue trends, content usage trends and network activity to inform strategy.
- **Digital service creation and evolution:** From contextual and personalized services to innovative credit models, digital companies can create offerings in real time to generate new revenue streams. By applying AI, ML and analytics to customer data, digital companies can understand what customers want, why they want it, and what they may want in the future. They can also

create more personalized content by recommending new plans, applying new discount, bundling and pricing models, and delivering new services such as entertainment options, on-demand programming, and location services. Finally, they can predict content and service popularity and use that information to evolve the business. By baking AI directly into communications cloud applications, the new tools provide fast insights to make decisions more easily.

- **Intelligent IoT services:** AI and ML will play a pivotal role in creating new services from vast amounts of IoT data as IoT devices become more intelligent. For example, AI can provide real-time responses to a remote video camera capturing a security breach or weather sensors monitoring a storm by processing the information, seeking out patterns over time and running predictive analytics.
- **Measuring results:** AI, ML, and analytics can be used to measure campaign results and return on investment, harnessing that data to ensure that the right offers are delivered to customers at the right time, and to predict what buyers will respond to next. To be truly effective, a comprehensive analytics solution must combine dynamic self-service discovery with enterprise reporting and advanced analytics capabilities. From an administration perspective, that means governance and flexibility, access to any type of data source, as well as data preparation and analysis capabilities for all users.
- **Digital business efficiency:** Expediting receivables collection, automated billing, intelligent payment retry for failed recurring payments, anticipating collections challenges, detecting and acting on fraudulent transactions, and improving pricing recommendations are some of the ways that AI can be applied to improving business efficiency.

### **Priority #3: Network and Security Evolution**

Networks today are the foundation for information, communication, commerce, and entertainment. The Internet of Things, new cloud technologies and mobile traffic growth are pushing these networks to handle higher data volumes and extract and act on meaningful device data. Automation combined with software-defined networking, network function virtualization, advanced policy control and intelligent routing are becoming critical for better network planning and traffic management, new connectivity and digital services, and detecting and resolving security issues:

- **AI-driven predictions, trends and decision making** to proactively manage network and cloud resources, applications, and dynamic traffic. Accurately predicting network and user trends could lead to significant improvements in network health and user experience. AI combined with policy and intelligent traffic routing can be used to continuously optimize networks according to traffic volumes, user behavior, applications usage, and other parameters. For example, AI can detect network problems, predict when a system might fail and take action by using policies to distribute network resources differently. Services can be automatically adjusted using policies based on user needs, environmental conditions and business requirements. And network paths can be automatically selected for cloud connectivity to ensure optimal application performance.

- **AI-infused IoT systems** can capture information from a wide array of connected sensors and use ML in the cloud to sort the data and make decisions, such as issuing weather, traffic or pollution alerts, providing personalized content, helping healthcare workers diagnose patient conditions, or deciding when a device should be replaced before it fails. In communications networks, intelligence built into Diameter Routing Agents can detect rogue or suspicious devices and use powerful AI-based analytic systems to further examine device behavior. This provides real-time information on what is causing the malfunction, protecting the core network as well as the IoT platform and applications from corrupt data and malicious attacks. AI and machine learning can also feed into policy management systems to augment capabilities with more dynamic and proactive actions.
- **ML-based fraud detection and security** systems can apply behavioral analysis to detect patterns and anomalies compared to historical network data. AI software can then use this information to prevent fraud and network attacks, and resolve security issues. For example, mobile and Voice over IP toll fraud, ID spoofing, and PBX hacking can be stopped by using a combination of ML and AI to trace user steps and transactions, analyze usage behaviors and intentions against known suspicious factors, and request immediate actions using preventative models.

## CASE STUDIES

### Case Study #1 – AT&T

AT&T is taking a phased approach to AI integration across the business

- Voice apps and speech recognition.
- Network transformation including self-healing and self-learning.
- IoT and Big Data.
- Processing online customer service chat interactions.

### Case Study #2 – Idea Cellular

IDEA Cellular in India is using Oracle Management Cloud and ML to unify their mission critical Enterprise Resource Planning, Customer Experience, and mobile applications.

- Applying ML for proactive detection of application anomalies, proactively preventing system outages.
- Achieved a 30% reduction in time to do root cause analysis of infrastructure issues.

### Case Study #3 – Vodafone

Vodafone is using chatbots to improve customer engagement by applying ML for proactive detection of application anomalies and to proactively prevent system outages.

- New 'TOBi' chatbot is helping customers online.
- Handles a range of customer service questions including troubleshooting, order tracking, and usage.

- It will speed up responses to simple customer queries, delivering the speed that customers want.

#### Case Study #4 – Latin American Service Provider

A Latin American CSP is automating revenue forecasting based on the number of call detail records per month.

- Using the past five years of call volumes.
- Breaking down records by day of the week, week of the month, month of the year.
- Removing seasonality, holidays and other factors.
- Improved forecast accuracy from 5% to 2% deviation.

### TRANSFORM YOUR BUSINESS WITH ORACLE COMMUNICATIONS

By moving communications infrastructure to a robust and integrated Oracle Cloud platform, digital service providers can gain access to the unlimited data, computing power, and cost efficiencies required for a solid AI, analytics and ML foundation (see Figure 2).

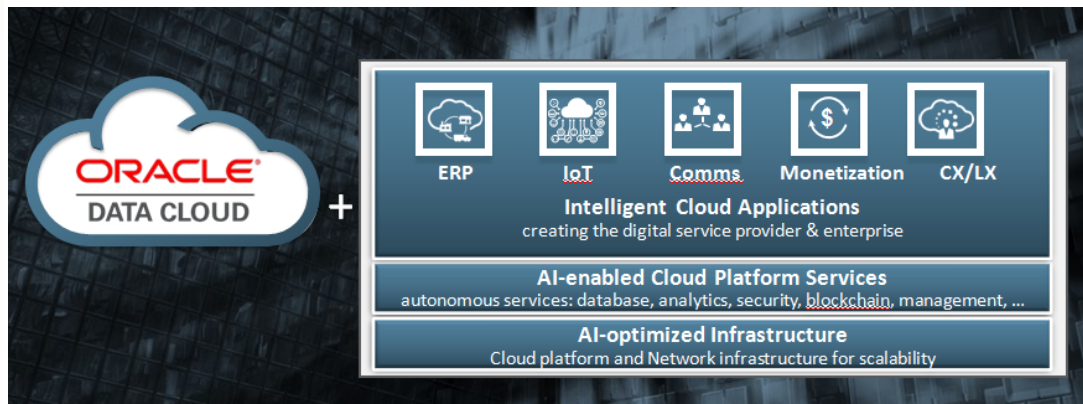


Figure 2. Oracle's AI-Powered Solutions

They can also gain access to Oracle's cloud-based AI, ML and Analytics solutions including:

- **Oracle Mobile Cloud Service**, a platform with built-in applications such as mobile location and push notification services, analytics and more recently intelligent bots, that help companies provide engaging services across all digital channels. **Oracle Intelligent Bots** include five core AI capabilities: ML, cognitive services, knowledge services, dialog and context, and data and insights. A pipeline of AI algorithms collectively works to understand and process the customer's input expressed in freeform natural language. Algorithms are used to support language translation, image recognition, sentiment analysis, and more. Developers define how the conversation should flow, what kind of questions customers might ask, and which messaging channels—such as Messenger, Slack, voice-based assistants, or others—customers can use. Natural language processing capabilities built into the platform understand and learn the nuances and context of conversations. APIs are used to integrate Bots into the Oracle Communications Live Experience Cloud solution for contact centers.

- **Oracle Intelligent Cloud Applications** create rich, contextual data profiles from data captured across Oracle Software-as-a-Service (SaaS) applications and combine it with third-party data from **Oracle Data Cloud**, which has more than 5 billion global consumer and business profiles and 45,000 consumer lifestyle attributes, with more than 7.5 trillion data points collected monthly. This gives digital service providers a much deeper understanding of who their customers are, what they do, and what they buy. For customer experience, a robust customer portrait influences ecommerce search and recommendations, refines marketing offers, and makes other predictive insights. ML considers prediction accuracy, such as choices made or not made. The unique property of these learning-enabled applications is that they detect trends, learn from results, and increase their accuracy the more they are used. They also add massive amounts of contextual data, such as weather, life events, real-time actions, and social activity to get a clearer picture on what motivates customer experiences and outcomes. These applications have a direct impact on business results by leveraging data across platforms including Customer Experience, Enterprise Resource Planning, IoT, Monetization and Live Experience Cloud solutions.
- **Oracle Management Cloud** is another example of an AI-powered application available as a cloud service. It combines big-data processing techniques with ML to help companies detect anomalies in very large data sets that indicate problems in a network, for example, or patterns that indicate system security has been breached. The data can include the identities of people logging onto network management systems, for example, or unusual network and traffic activity. It can help network and service operations centers quickly address critical problems whose solutions are hidden in data sets too large for humans to evaluate. The software can notify a systems operator to take corrective action or even fix the problem automatically. Oracle's management capabilities include security services, such as Oracle's Cloud Access Security Broker, which uses ML to enhance its threat- and data-protection capabilities.
- **Oracle Analytics Cloud** helps digital companies thoroughly understand all the data at their disposal. Capabilities include descriptive analytics to understand what has happened over a period of time. With the application of AI, the system also can conduct diagnostic analytics. With Oracle Analytics Cloud, powerful analytics tools do the hard work behind the scenes while business users simply ask the computer simple questions. The answers can be displayed as graphs, charts, or other visual representations. Sophisticated visualization tools allow the system to automatically select the best way to display the data in graphs or charts. The system will also generate a detailed description of the analytics findings for study and discussion.
- **Oracle Communication Fraud Monitor** detects and prevents Voice over IP fraud by creating a network-wide data model that performs real-time, automated user behavior analysis, compares it with individual behavioral patterns automatically learned by the system for each user, applies scores, and generates alerts warning of fraud risks.
- **Oracle AI Platform Cloud Service** provides ML and data specialists with a simple and fast way to set up a complete environment for work on ML in the cloud. It includes pre-installed tools such as: common ML frameworks for advanced algorithms and models that can be exported and ready for use in applications, popular AI libraries, and easy access to existing data sources.



## WHY ORACLE?

Oracle is the leading provider of communications and cloud solutions enabling customers to connect, engage, and monetize their services. Count on Oracle to accelerate your digital transformation with AI in the cloud:

- Robust, secure and integrated cloud platforms and network infrastructure
- Cloud, communications, AI, and ML expertise
- AI across all cloud services
- A complete suite of AI-enabled business applications
- AI-enabled network applications
- AI-enabled platform services such as management, security, and chatbots
- Best-in-class software-as-a-service
- Flexible deployment - on-premise, hybrid and cloud
- World-class customer success organization

For further information, visit [www.oracle.com/communications](https://www.oracle.com/communications)

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## Integrated Cloud Applications & Platform Services

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