The Rise of Artificial Intelligence

Sarah Tran, MCI Goldmine Team

Feb 9, 2018

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David Mascha

> *AI could develop a will of its own . . . The rise of AI could be the worst or the best thing that has happened for humanity.*

Stephen Hawking

The State of Artificial Intelligence

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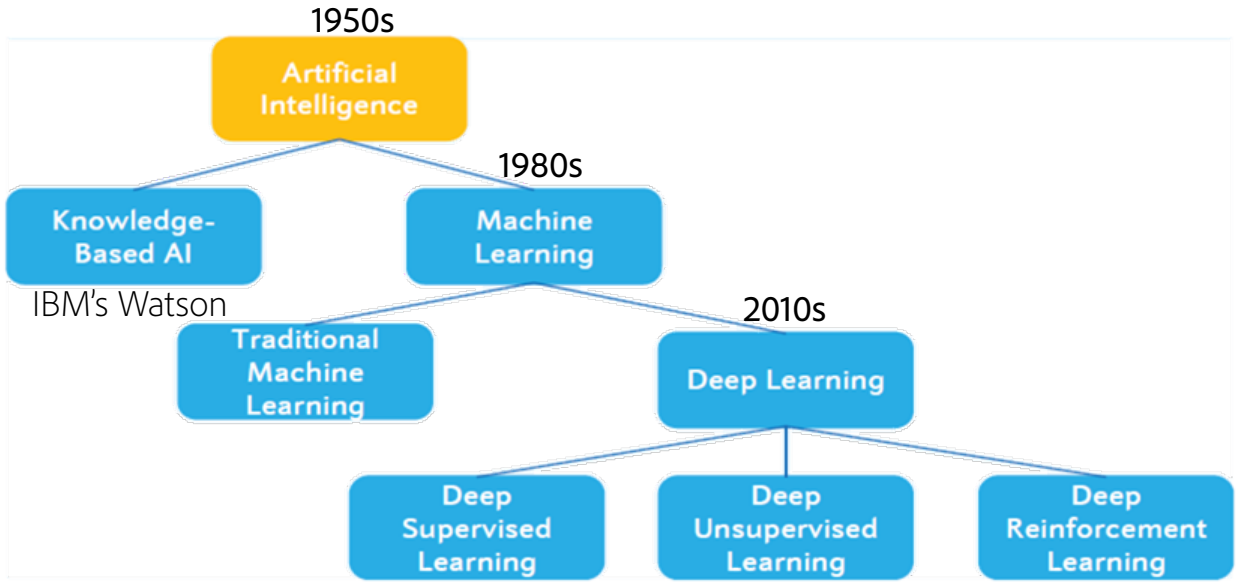
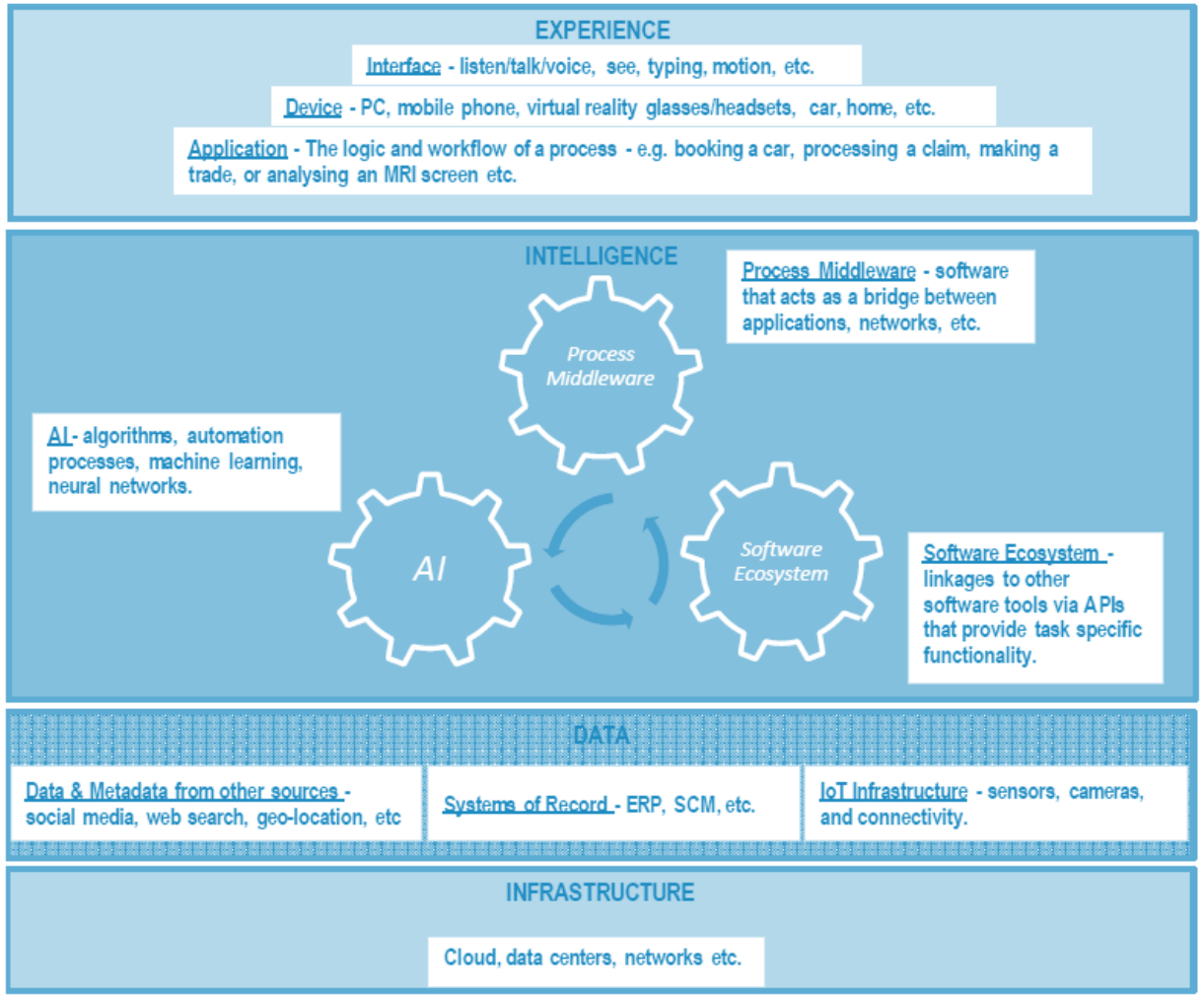
What Is Artificial Intelligence (AI)?

Artificial Intelligence (AI): A set of technologies that uses deep natural language processing and understanding to answer questions and provide recommendations and direction (IDC).



Source: Barclays Research

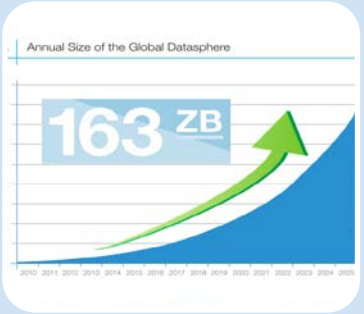
Figure 6: Layers of the AI ecosystem



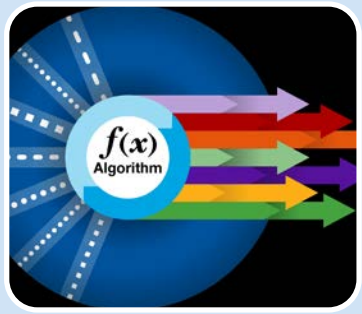
Source: Adopted from Cognizant and "What to Do When Machines Do Everything", Frank, Roehrig, and Pring.

Source: An Investors' Guide to Artificial Intelligence (JP Morgan, Nov 2017)
Source: A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)
Source: Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending by Industry Market 2016–2020 Forecast (IDC, Jun 2017)

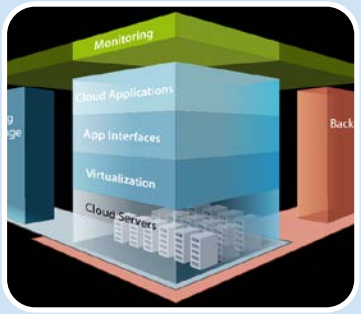
Why Is AI Accelerating Now?



Data growth: Access to large quantities of data and the ability to store that data



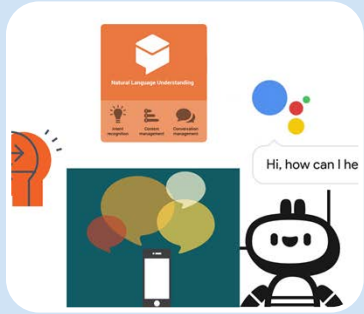
Algorithmic competency: Improvements in machine learning competency are leading to better algorithms and improved platforms to develop new algorithms



Scalable infrastructure: The development of large technical infrastructure that can train machine learning algorithms

Demand for autonomous vehicles: AI, machine learning and deep learning are key to ensuring self-driving cars can quickly and automatically adapt to changing scenarios

Growth in connected devices: AI applications can use data generated from devices to provide real-time actionable information and conduct predictive analysis



Virtual Assistants: Consumer apps (Siri, Alexa et al) pave the way for enterprise conversational apps for product advisement, recommendation, process improvement, & decision making

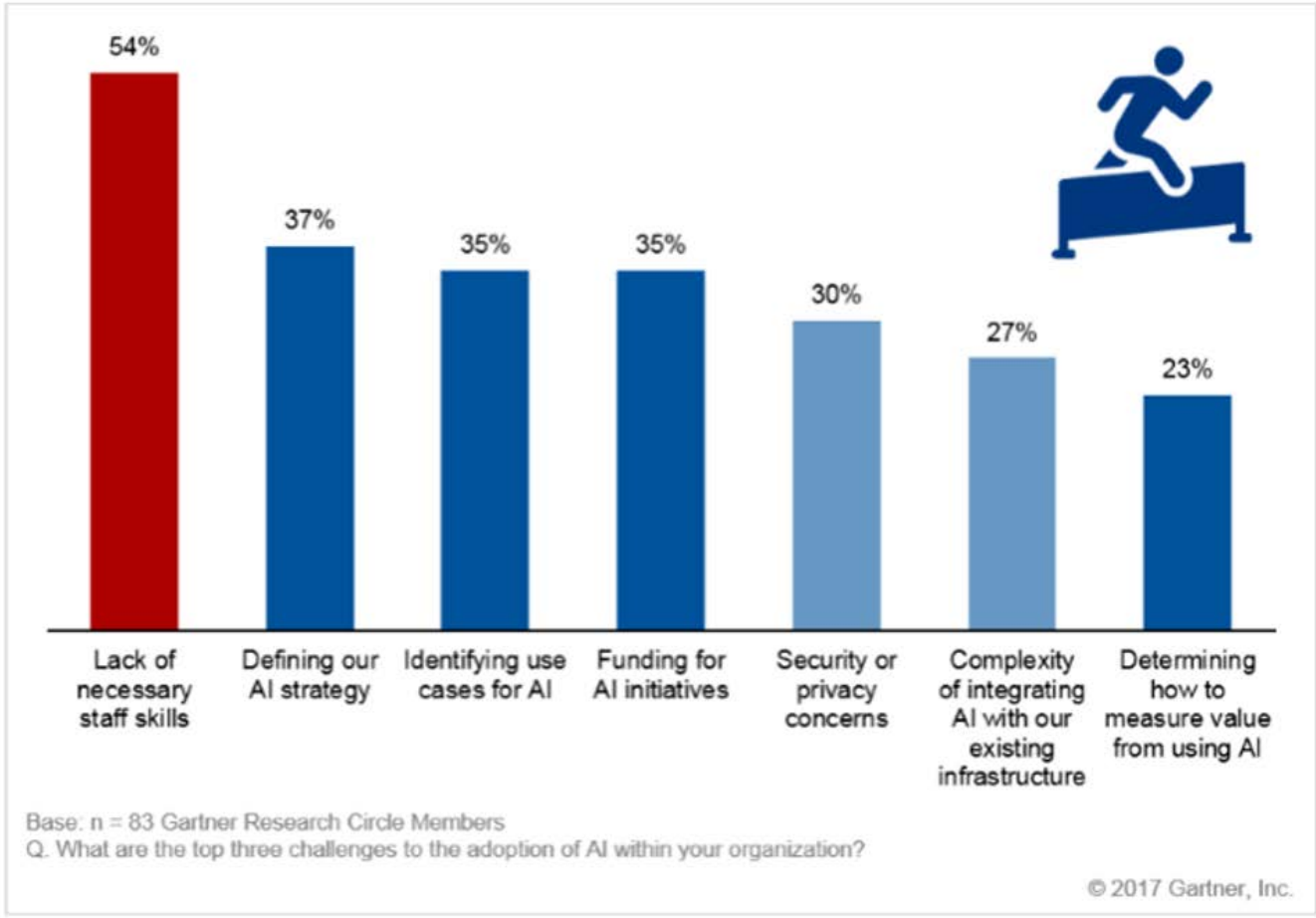
Source: Worldwide Cognitive/Artificial Intelligence Software Platforms Forecast, 2017–2021 (IDC, Jun 2017)
Source: Artificial Intelligence Software Industry (Acquisdata, Nov 2017)
Source: A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)

Potential Barriers to AI Adoption

Key challenges:

- Shortage of skilled staff
- Trouble defining an AI strategy
- Lack tools to help organizations find, gather, and curate information used by the AI system
- Fears of job loss
- Security or privacy concerns
- Complexity
- Identifying use cases and ROI for AI applications.

Lack of skilled workforce is the #1 hurdle companies face in adopting AI



Source: Gartner (November 2017)

Source: Predicts 2018: Artificial Intelligence (Gartner, Nov 2017)

Spending on AI and Cognitive Systems Grows to >$50B by 2021

Cognitive/AI systems spending to show **50% CAGR** to 2021

$12B

$57.6B

2017

Spending on cognitive and AI systems was $12 billion

2018

Over 20 million U.S. households will own electronics integrating cognitive systems

20% of major retailers will use AI to personalize the brand experience from awareness through purchase

2019

More than 10% of IT hires in customer service will mostly write scripts for bot interactions

Startups will overtake Amazon, Google, IBM and Microsoft in driving the AI economy with disruptive business solutions

AI platform services will cannibalize revenues for 30% of market-leading companies

2020

20% of citizens in developed nations will use AI assistants to help them with an array of everyday, operational tasks

20% of companies will dedicate workers to monitor and guide neural networks

AI-driven creation of "counterfeit reality" (fake) content will outpace AI's ability to detect it, fomenting digital distrust

2021

40% of customer-facing employees will consult daily an AI virtual support agent for decision or process support *(2022)*

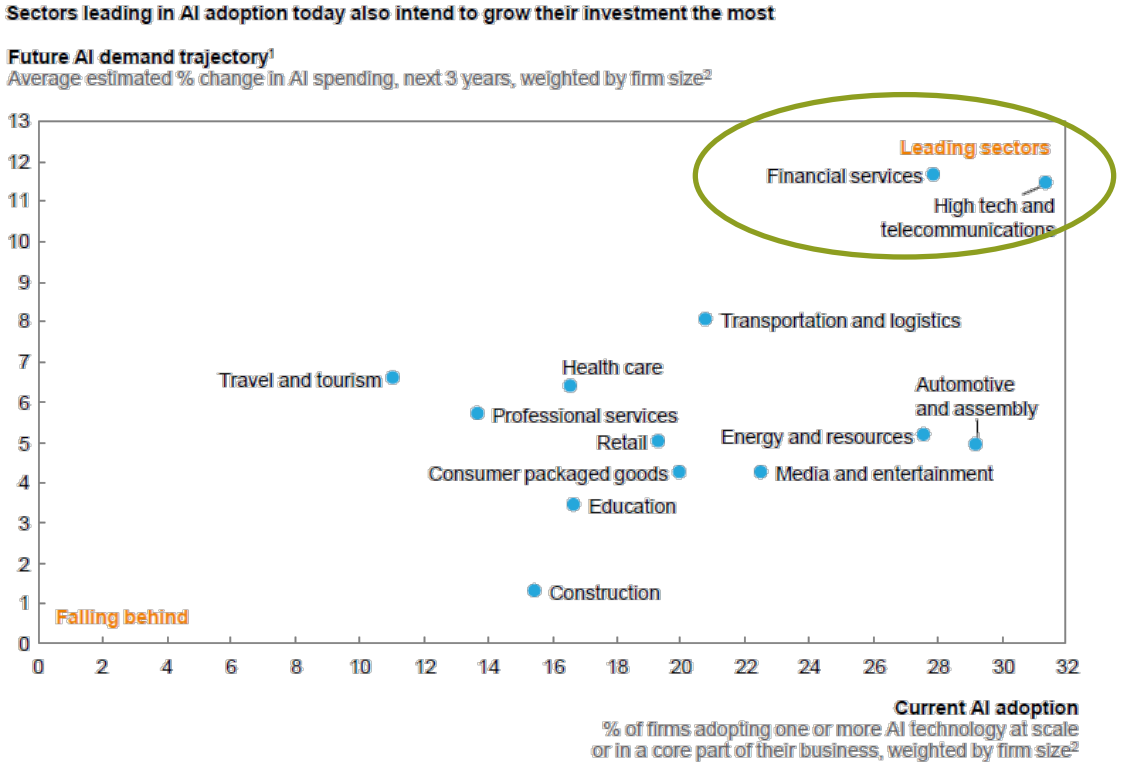
Enterprise AI projects with built-in transparency will be 100% more likely to get funding from CIOs *(2022)*

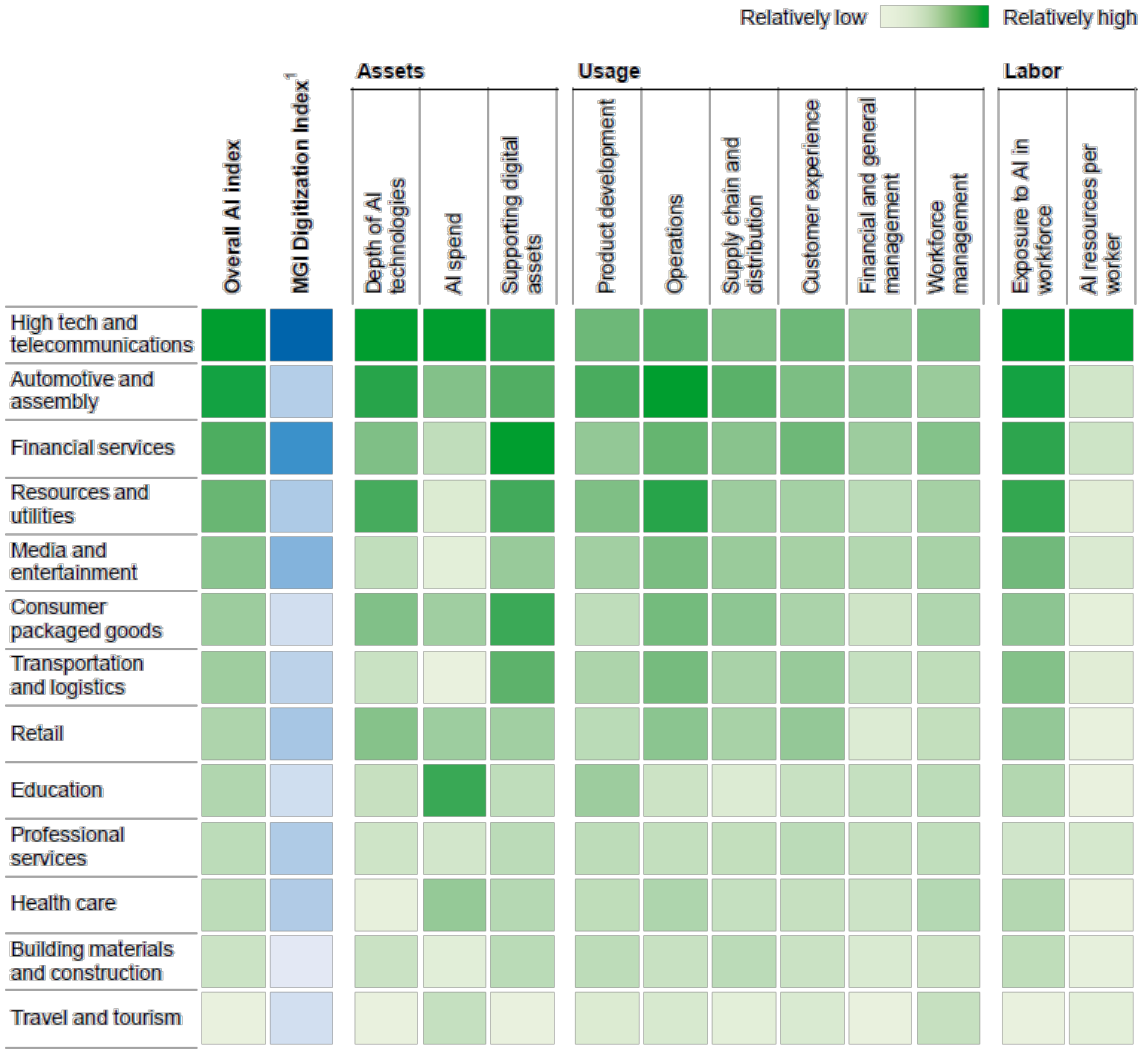
Most people in mature economies will consume more false information than true information *(2022)*

Source: Cognitive/AI Systems Scale Personalized Experiences (IDC website)
Source: Predicts 2018: Artificial Intelligence (Gartner, Nov 2017), Predicts 2017: Artificial Intelligence (Gartner, Nov 2016)
Source: "IDC Spending Guide Forecasts Worldwide Spending on Cognitive and Artificial Intelligence Systems to Reach $57.6 Billion in 2021" (IDC press release, Sep 2017)

AI Adoption Is Occurring Faster in More Digitized Sectors

- Larger companies and industries that adopted digital technologies in the past are more likely to adopt AI.
- High tech, telecom and financial services are the leading frontiers for AI adoption. Automotive and assembly is also highly ranked; it was one of the first sectors that implemented advanced robotics at scale for manufacturing, and today is also using AI technologies to develop self-driving cars.





Source: Artificial Intelligence: The Next Digital Frontier? (McKinsey Global Institute, Jun 2017)

How Are Enterprises Using AI?

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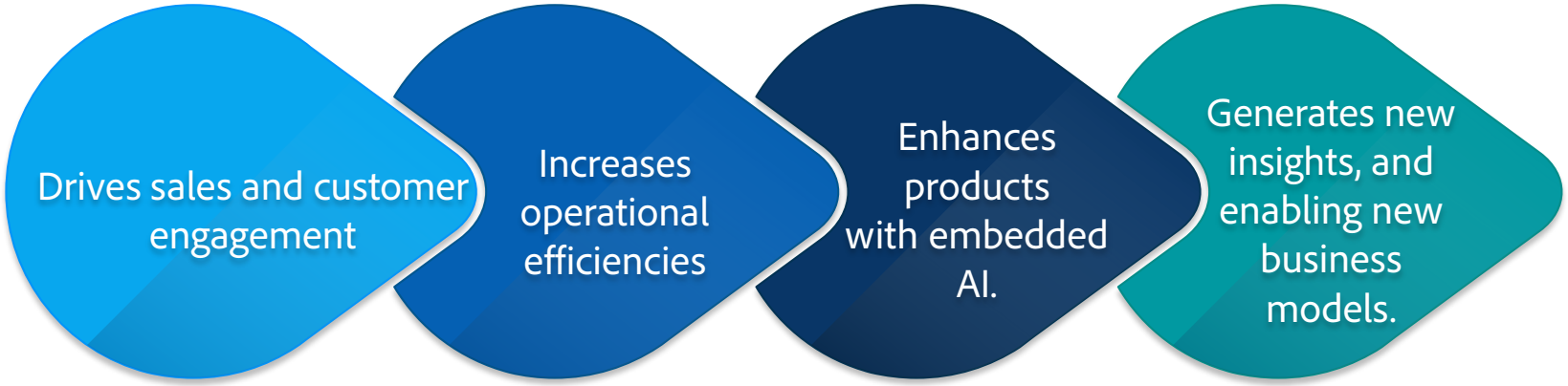
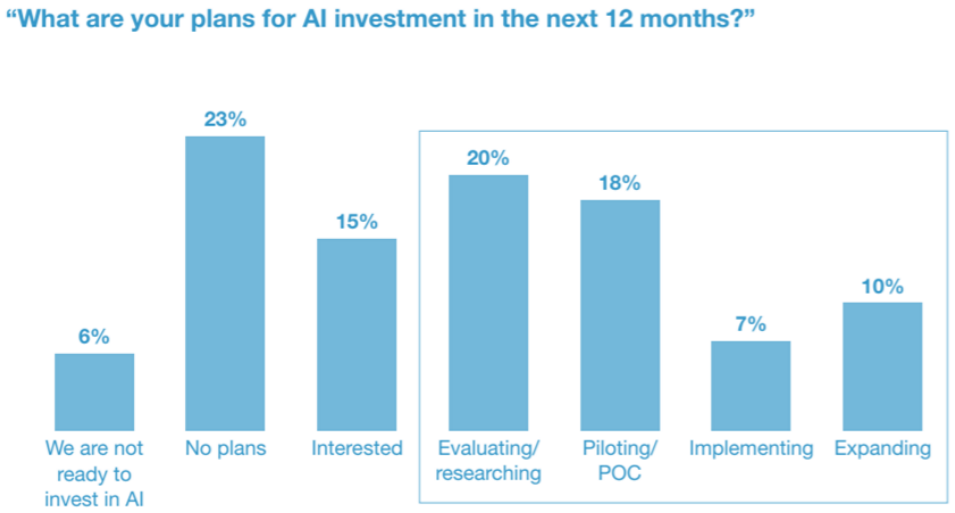
What Does AI Bring to the Enterprise?



55% Of Enterprises Are Investing In AI



Customer- and product-focused areas dominate AI investment

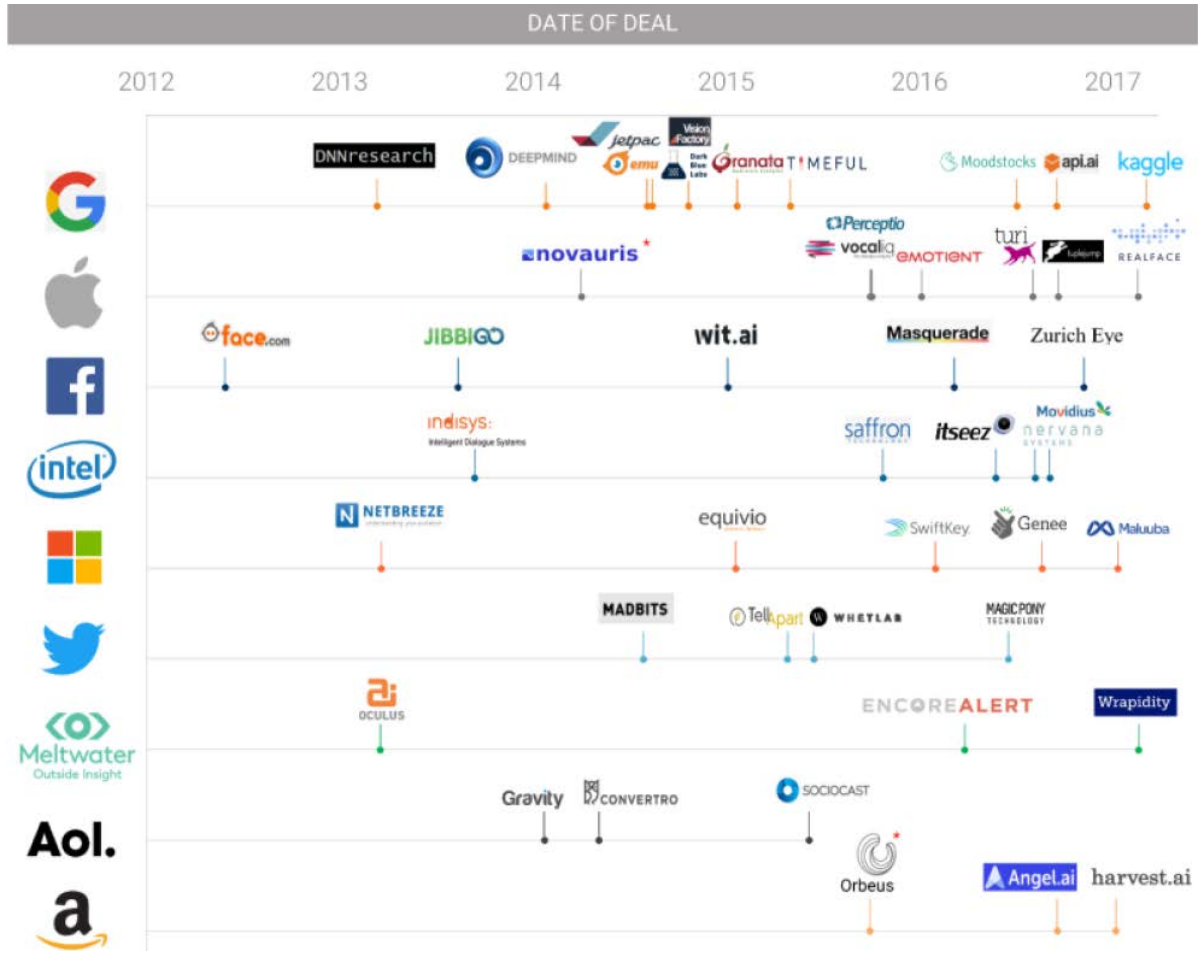
Source: An Investors' Guide to Artificial Intelligence (JP Morgan, Nov 2017)
Source: The Promise and Potential Peril of AI (Forrester, Jan 2017)

The Race to Artificial Intelligence: Google, Facebook, Apple, and Other Tech Giants Are Acquiring AI Startups

200+
Acquisitions since 2012

30+
M&A deals in Q1'17

11
Acquisitions by Google



Source: The State of Artificial Intelligence (CB Insights, Dec 2017)

The Tech Giants Bet Big on AI

IBM Watson

amazon

Google Brain & AlphaGo

- Rebranded to become an "AI-first" company
- Search: Incorporated RankBrain, a deep learning technology that helps refine queries & rank web pages, into its Search engine
- Recommendations: Google Brain improves recommendations for YouTube users, leading to increases in watch time
- Waymo: Autonomous vehicle division
- AlphaGo: Utilizes technology like advanced tree search, deep neural networks, and reinforcement learning.
- The DeepMind team believes their approach behind AlphaGo can be commercialized and applied broadly to solve general problems in the world

IBM Watson

- IBM's Watson solutions represent a set of comprehensive and adaptable intelligence systems with applications ranging from oncology to customer support using open APIs.
- Watson is configured to analyze clients' in-house as well as public and IBM proprietary data
- IBM offers cognitive solutions across healthcare, education, BFSI, media, and retail verticals
- Products and services include conversational chatbots for automated services, data discovery tools, natural language understanding and processing for text analysis, text-to-speech conversion, visual recognition for image analysis, and language translators.

Facebook Learner Flow

- Developed a dedicated Machine Learning Platform ("FB Learner Flow"), which has been used for products within Search, Ads and NewsFeed
- Deep Text: A deep learning-based AI engine built to understand sentiment and context behind text on social network
- AI on NewsFeed: Tackles problems related to speech recognition, natural language understanding and language translation
- "M Suggestions" an AI-based assistant embedded within the Messenger app that uses deep learning to understand context and intent in a chat to make content suggestions
- Moments: FB's photo-sharing service uses image recognition models to let users create private photo albums with a select group.

Amazon

- Amazon was an early adopter of AI throughout retail and cloud business segments
- Product recommendation engine: Automatically predicts user preferences and responses to queries based on past behavior, one user's relationship to other users, similarity among items being compared, and context
- Amazon Alexa: Voice-assistant, brains behind Amazon's Echo devices.
- Amazon Web Services: Uses AI to increase the efficiency of its cloud operations
- Amazon Polly: Amazon's text-to-speech service
- Amazon Reckognition can help detect objects, scenes, text, faces, etc.

Source: An Investors' Guide to Artificial Intelligence (JP Morgan, Nov 2017)

Adobe

Beyond Adobe, Other Software Companies Also Enter the AI Race

Salesforce Einstein

- Salesforce made early investments in AI development and supplemented that with a series of acquisitions, giving it first mover advantage in the CRM-AI space.
- In the Marketing Cloud, Einstein provides targeted recommendations to customers based on their historical data, while Social Insights gauge sentiment of news from around the world. And Einstein Segmentation assembles targeted audiences based on machine learning and pattern analysis to help better understand customer attributes.
- In the Sales Cloud, Einstein is used for lead scoring, opportunity analysis and automated contracts.
- Einstein can be purchased as an add-on to Cloud subscriptions, at a rate of generally less than $100 per user/month.

SAP Leonardo

SAP Leonardo

- SAP is combining its historical ERP data with its new AI focused offering, SAP Leonardo.
- SAP Leonardo is an umbrella that encompasses a number of new technologies: AI, Machine Learning, IoT, and Blockchain.
- SAP views Leonardo as differentiated as it connects its users' historical data that has built up over time to live sensor and market data to deliver real-time insights.
- SAP's integration of AI is prescribed on a use-case basis to support different verticals.
- SAP plans to partner with Google to create more effective commercial machine learning applications.

ORACLE

Oracle Adaptive Intelligence Apps

- Oracle offers a full stack of AI enterprise applications called Adaptive Intelligent Apps.
- The Oracle Data Cloud contains over 5 billion consumers and business profiles, which the company uses to power their Adaptive Intelligent Apps.
- The Oracle Analytics Cloud uses machine learning to help deliver insight from customer data, and machine learning capabilities are incorporated into the CX CRM.
- Oracle's intelligent bots is a service that allows companies to build custom chatbots with machine learning development already built out.

Source: A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)

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What Does AI Mean for Adobe?

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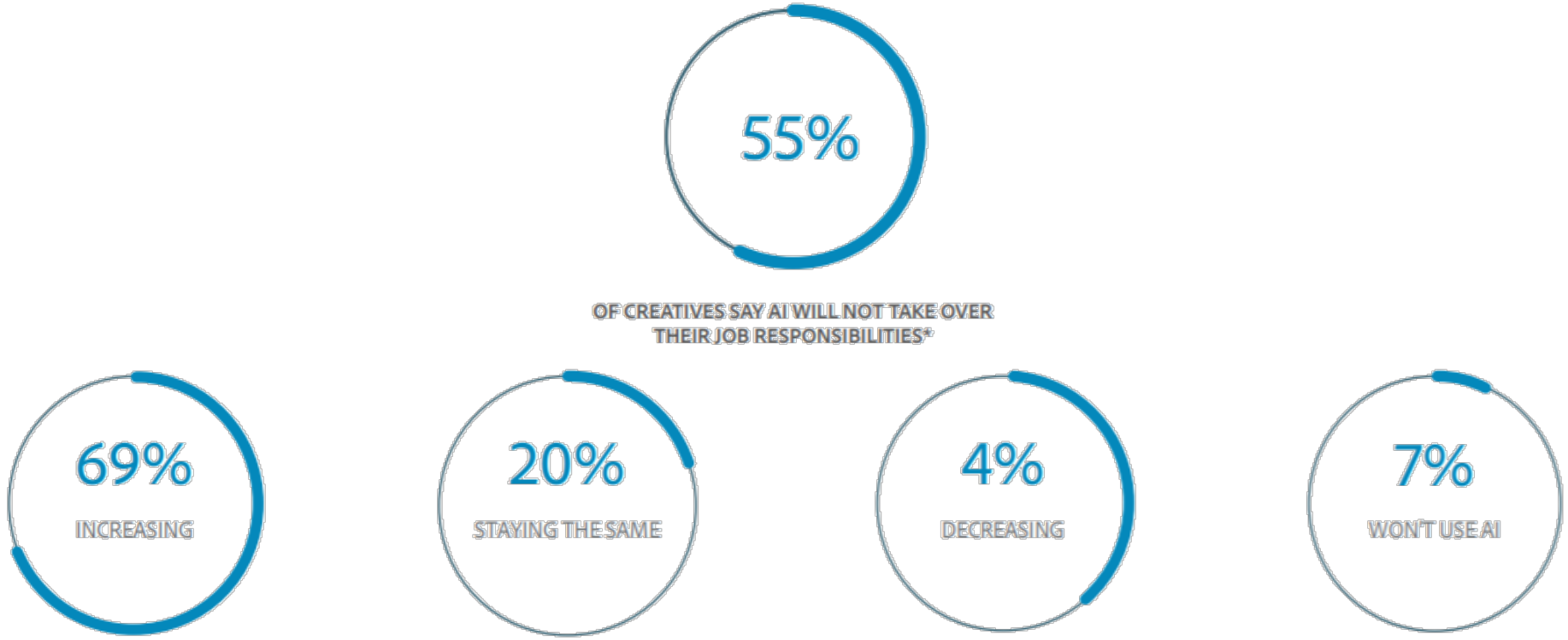
Creatives Are Optimistic about AI

- More than half of creative practitioners are optimistic about AI and don't foresee automation taking over their job responsibilities in the next ten years.
- Innovations in AI can remove barriers and eliminate tedious, repetitive tasks so designers have more time to do the more impactful, creative aspects of their jobs.

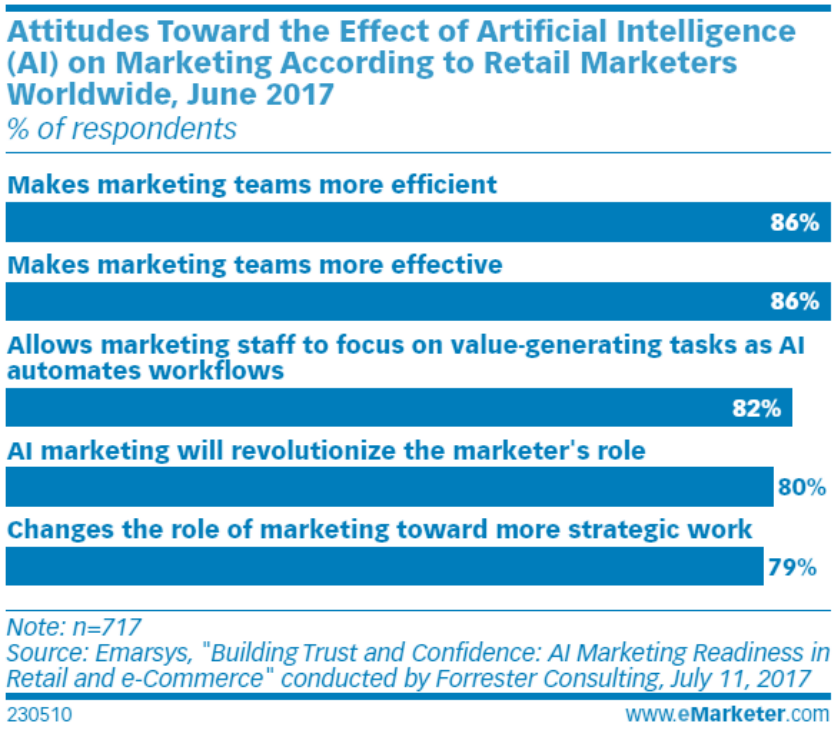


Source: The State of Creativity in Business (Adobe and Advanis, Oct 2017)

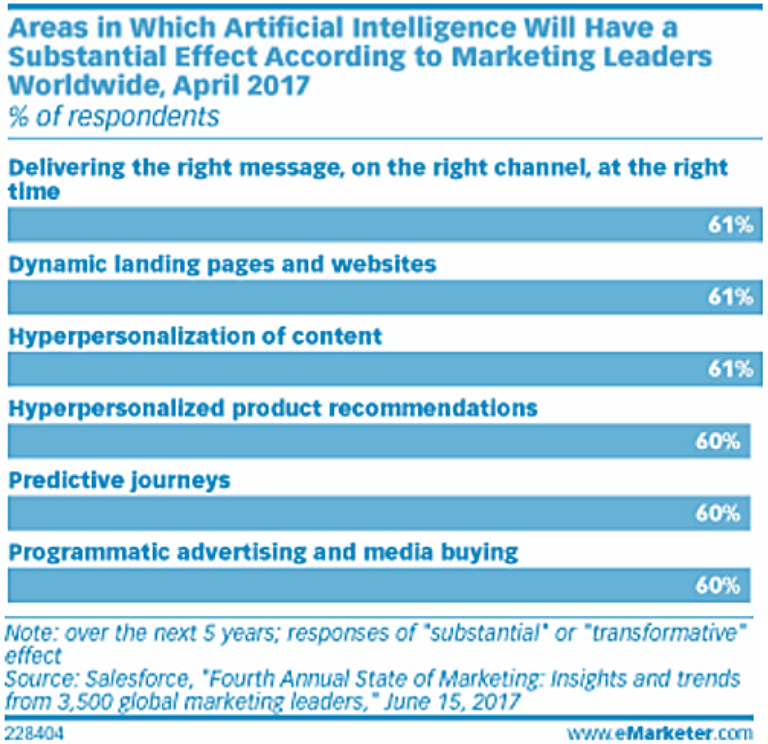
AI Is the Core of Digital Disruption for Marketers

80% of B2B marketing executives surveyed believe AI will "revolutionize" the marketing industry by 2020.

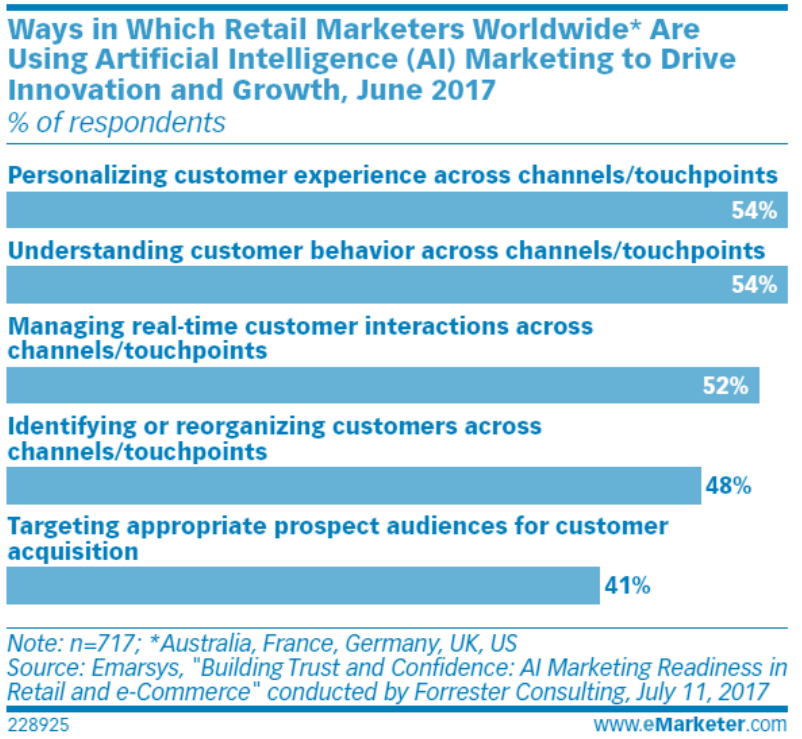
More than 80% of marketers believe AI will make them more efficient and effective, and will free them up to do more high-value work.



At least 60% of marketing leaders surveyed worldwide believe AI will have a transformative effect in the next five years



54% of retail marketers are using AI-driven personalization across channels to drive growth in their businesses



Source: Artificial Intelligence for Marketers: 2018-Finding Value Beyond the Hype (eMarketer, Oct 2017)
Source: A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)

Adobe's Revolutionary AI Journey

Creative Cloud

With Sensei, artists are able to leverage their past work, and (with Adobe Stock) other artists' past work to aid the creative process.

Face-aware liquify: Detect facial features so that you can change expression or perspective without distortion.

Visual stock search: Find the perfect image faster by filtering for characteristics like "depth of field" and "vivid color."

Morph cut: Create polished interviews faster using face tracking and optical flow interpolation to smooth out jump cuts.

Document Cloud

Easily find and edit relevant documents with Sensei using more than exact words/filenames.

Intelligent scans: Detect key components of documents to convert to PDF.

Adobe Sign: Fill, sign, and send forms fast from your desktop, browser, or mobile app.

Accessible PDFs: Make PDFs accessible to visually impaired customers through semantic structure analysis and document flow extraction.

Experience Cloud

Sensei will analyze data on how customers react to marketing and advertising to anticipate what they will want next using predictive modelling.

Smart tags: Adobe Experience Manager provides content-based metadata for images in seconds, saving hours of time.

Anomaly detection: Adobe Analytics proactively alerts you to anomalies and explains changes in customer behavior.

Budget allocation: Adobe Media Optimizer balances and optimizes ad spend across channels.

Adobe Named A "Major Player" in IDC's Assessment of AI Capabilities in Marketing Clouds

Table 1: IDC-Defined AI-Enabled Marketing Use Case Availability by Vendor

AI-Enabled Use Case	Complexity	Adobe	Blackbaud	IBM	Marketo	Salesforce	SAP Hybris
Chatbots	Medium			Yes			
Virtual sales rep/qualifying engine	Medium			Yes			
Social sentiment analysis	Low			Yes		Yes	Yes
AI-enabled recommendation engines	Medium	Yes		Yes	Yes	Yes	Yes
Live/online event monetization	Medium	Yes					
Cognitive commerce/merchandising	High	Yes		Yes		Yes	Yes
Cognitive content marketing	Low	Yes		Yes	Yes	Yes	Yes
Dynamic content							
Media mix optimization	Medium	Yes					
Attribution analysis	High	Yes		Yes		Yes	Yes
Budgeting	Medium						
Competitive intelligence	Medium			Yes			
Strategic planning	Medium		Yes				Yes
Lead scoring	Low	Yes		Yes		Yes	Yes
Opportunity scoring	Low	Yes	Yes			Yes	Yes
Pipeline/sales forecasting	Low					Yes	
Cross-selling/upselling	Low	Yes		Yes		Yes	
Audience segmentation	Medium	Yes	Yes	Yes		Yes	Yes
Ad buying	Medium	Yes					Yes
Ad analysis/brand management	Medium	Yes					Yes
Number of other use case available	Varied	12+	–	5.00	–	5.00	5.00
Number of future use cases on road map	Varied	10.00	3.00	8.00	7.00	9.00	10.00

Source: IDC MarketScape Worldwide Artificial Intelligence in Enterprise Marketing Clouds 2017 Vendor Assessment (IDC, Dec 2017)

Adobe Sensei

- **Strengths**
  - Adobe is aggressively building on its strong heritage in data science with a massive allocation of over 1,000 internal developers, supported by training, project funding, and a top-down commitment to AI.
  - Adobe is refactoring its product architecture and cloud infrastructure to support the new world of streaming data and AI.
  - Adobe is also building out a full suite of higher-level services focused on designing and delivering digital experiences around AI and machine learning to support internal developers, partners, and customers.
- **Challenges**
  - Adobe's development platform is not ready for developers and customers to build their own models or embed Adobe capabilities into their applications.
  - The services and support organization, which is critical to partner and customer success with AI, is still being constructed.
  - Competitors have increasingly complete portfolios of customer-facing infrastructure

Recommended Artificial Intelligence Research on Goldmine

Referenced in this report:

An Investors' Guide to Artificial Intelligence (JP Morgan, Nov 2017)

A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)

Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending by Industry Market 2016–2020 Forecast (IDC, Jun 2017)

Worldwide Cognitive/Artificial Intelligence Software Platforms Forecast, 2017–2021 (IDC, Jun 2017)

Artificial Intelligence Software Industry (Acquisdata, Nov 2017)

A Deep Dive into Artificial Intelligence (Barclays, Sep 2017)

State of Artificial Intelligence for Enterprises (Teradata, 2017)

Predicts 2018: Artificial Intelligence (Gartner, Nov 2017)

Predicts 2017: Artificial Intelligence (Gartner, Nov 2016)

Artificial Intelligence: The Next Digital Frontier? (McKinsey Global Institute, Jun 2017)

The Promise and Potential Peril of AI (Forrester, Jan 2017)

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The State of Creativity in Business (Adobe and Advanis, Oct 2017)

Artificial Intelligence for Marketers: 2018-Finding Value Beyond the Hype (eMarketer, Oct 2017)

IDC MarketScape Worldwide Artificial Intelligence in Enterprise Marketing Clouds 2017 Vendor Assessment (IDC, Dec 2017)

Further reading:

Market Analysis Perspective: Worldwide Cognitive/AI Platforms (IDC, Jan 2018)

Applying Artificial Intelligence to Enhance Market Insights (CEB Market Insights Leadership Council, Jan 2018)

The Customer Experience of AI: Five Principles to Foster Engagement, Innovation and Trust (Altimeter Group, Nov 2017)

The Myths & Realities of AI in Marketing & Sales (Demand Gen Report, Nov 2017)

Enterprises Jumping into AI, but Deployments Prove Challenging (UBS Research, Oct 2017)

Mapping The Artificial Intelligence-Based Analytics Landscape (451 Research, Sep 2017)

AI Will Revolutionize Digital Experiences (Forrester, Sep 2017)

Applying Artificial Intelligence to Drive Business Transformation: A Gartner Trend Insight Report (Gartner, Aug 2017)

AI in E-Commerce: How Artificial Intelligence Can Help Retailers Deliver The Highly Personalized Experiences Shoppers Desire (Business Insider Intelligence, Aug 2017)

Trend Briefing: Artificial Intelligence (Econsultancy, Jul 2017)

Hype Cycle for Artificial Intelligence, 2017 (Gartner, Jul 2017)

Worldwide Cognitive/Artificial Intelligence Software Platforms Market Shares, 2016: Artificial Intelligence Takes Off (IDC, Jun 2017)

Artificial Intelligence: Entering A Golden Age for Data Science (Cowen and Company, May 2017)

Cool Vendors in Artificial Intelligence for Marketing (Gartner, May 2017)

Executive Guide to Assessing Tangible and Intangible Impacts of Cognitive Computing and Artificial Intelligence (IDC, Mar 2017)

MAKE IT AN EXPERIENCE