

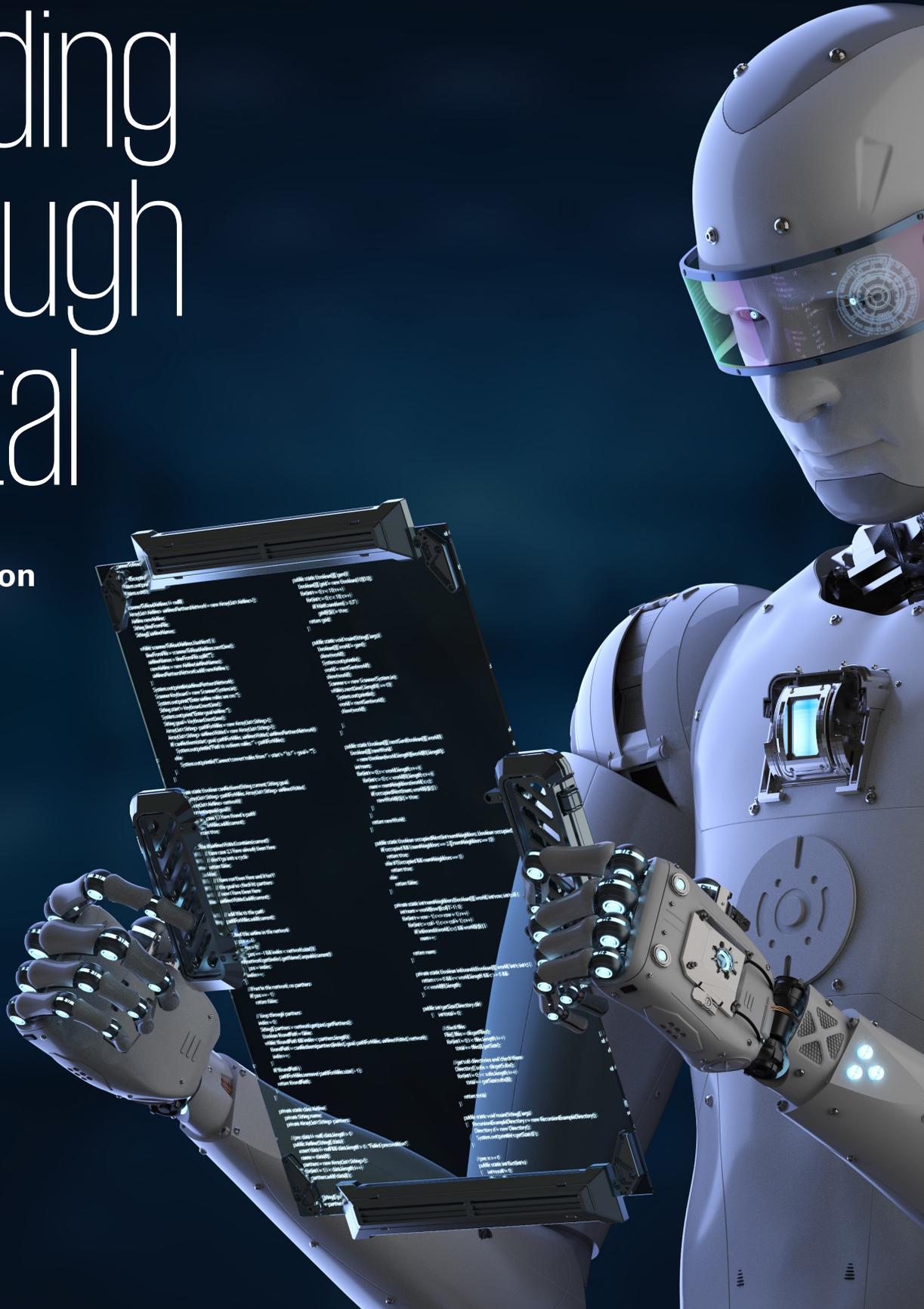


Leading Through Digital

AI Powered
Transformation

KPMG in Africa

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1.0

Foreword

AI-Powered Business Transformation

We are witnessing a new genre of companies shaping the business landscape by leveraging emerging technologies and applying them with such potency to create competitive advantage. These organisations have a quest to scale; they are big on customer experience; they are open to partnerships and are able to deploy their products and services at scale through APIs; they are big adopters of the cloud and quite often are born in the cloud; they embrace design thinking and are happy to return to first principles to find innovative solutions to business problems; and they are relentless at leveraging the power of artificial intelligence (AI) for insights and decision making.

Our focus in this publication is on the power of AI and its inherent potential to transform businesses if harnessed properly. As we study the Tech giants, we see a relentless focus on AI and its application at scale. Google's search engine and its widely adopted google maps are powered by AI while Apple & Tencent have strong customer analytics engines with the capability to study customers and prescribe products and offerings that are personalized. Amazon and Alibaba have extended the power of AI into their supply chain and are able to reduce cost to serve while delivering packages at significantly reduced times compared to incumbents.

We offer our perspective on the starting point for harnessing the power of AI – the journey should be Use-case led and not data-led. We note that many incumbents are stuck with data quality issues, have started some data cleansing projects, are usually frustrated by the unending nature of data cleansing and rarely derive any value from this tedious initiative. There is motion but no movement. The Use-case led approach is driven by the business problem that requires a solution and defining the business problem should be technology and data agnostic.

Selected Use cases need to have a strong link to business objectives and priorities. Once Use cases are determined, we offer a framework for guiding the journey from signals articulation, algorithm development, data harvesting all the way to generation of insights. We delve into the derivatives of AI – machine learning and deep learning and explain the benefits and applicability of each. We are generating tons of data every day and machine learning has a profound capacity to make sense of what is otherwise 'senseless data.'

Finally, we explore the challenges of adopting AI – challenges with storing data in the cloud, errors in algorithms, biases in data leading to predictably biased outcomes, regulation including data privacy and the dearth of AI talent, amongst other challenges.

We hope you find our publication useful in your quest to leverage the power of AI and look forward to engaging with you.



Boye Ademola
Partner & Lead
Digital Transformation
KPMG in Africa

Content

1.0 Foreword

02

2.0 Becoming AI-enabled
is a Journey

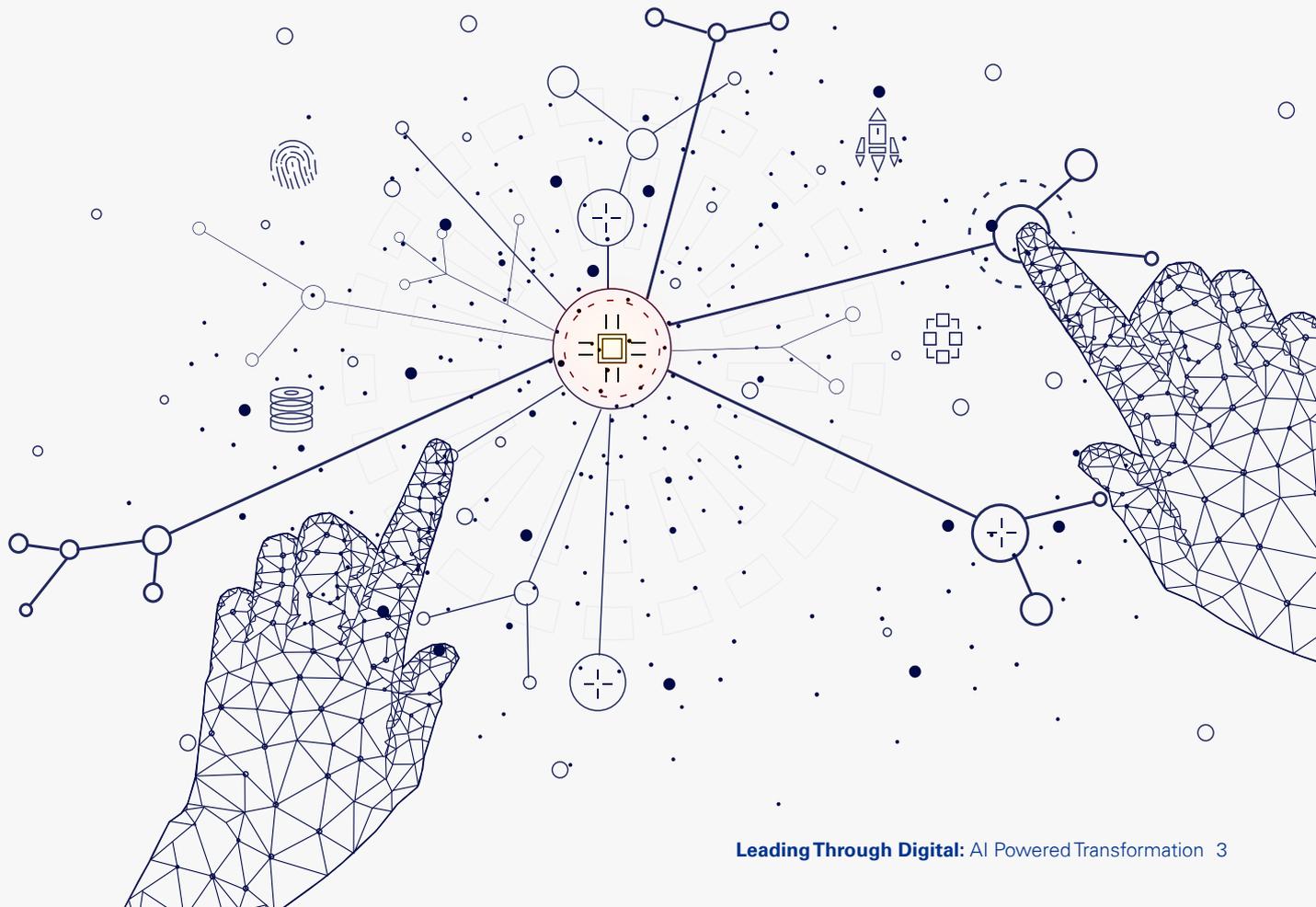
04

3.0 Unlocking the
Value of AI

10

4.0 Operationalizing AI

29





2.0

Becoming AI-enabled is a journey...

**The era of AI is well
and truly here – with
huge implications for
businesses across all
sectors.**

Artificial Intelligence (AI) is becoming a game-changer across industries and sectors. Indeed, for C-level executives, the question is no longer whether AI will fit into their business, but rather how they can reposition their organization to become AI-centric and fully capitalize on the transformational value of AI.

AI has huge implications for businesses across all sectors. For many organizations, harnessing the full potential of AI usually begins with an exploration of a few use cases which can deliver quick but valuable insights to set the pace for the journey to becoming an AI-centric organization. These organizations are building solutions embedded with AI capabilities which are key to automating business processes and enhancing customer experiences.

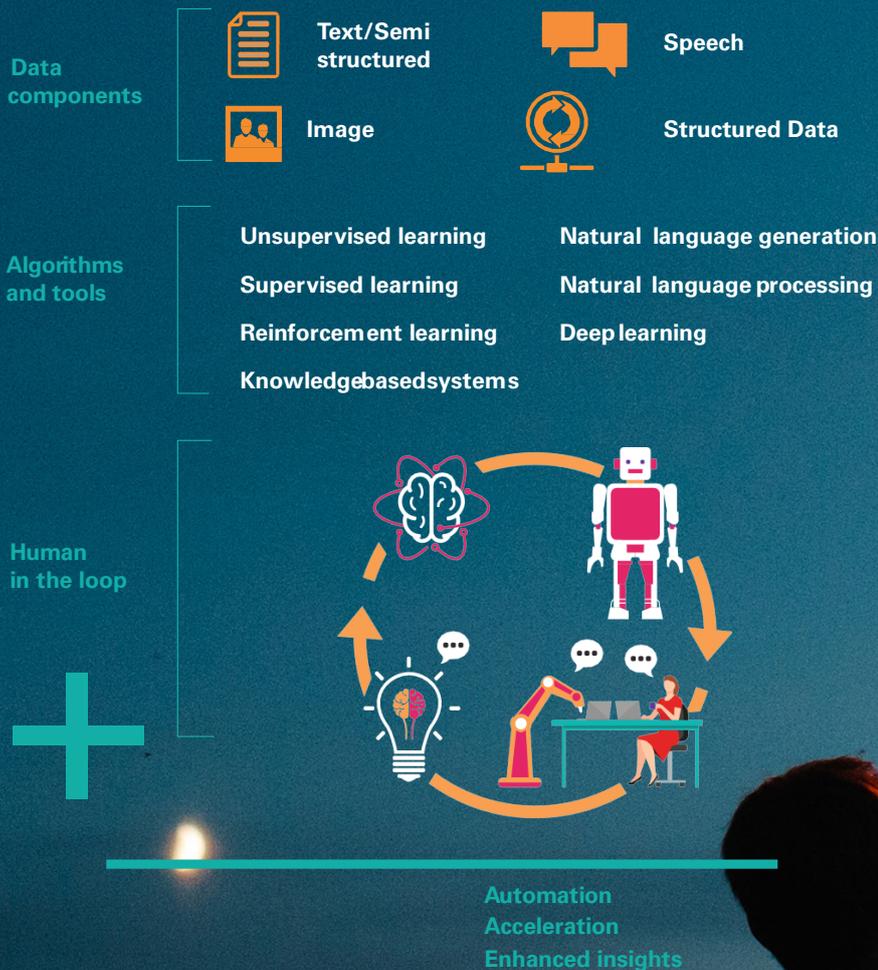
Organizations that are not incorporating AI in their business and customer interaction processes may have difficulties penetrating new markets and attracting new customers. Also, these organizations may fail to innovate with speed and effectively manage costs.

To derive value from AI, business leaders should deploy AI solutions to achieve strategic objectives rather than using AI to solve everyday business challenges. It is important to understand how AI can be leveraged to drive strategic objectives and accelerate known opportunities.

How we see AI....

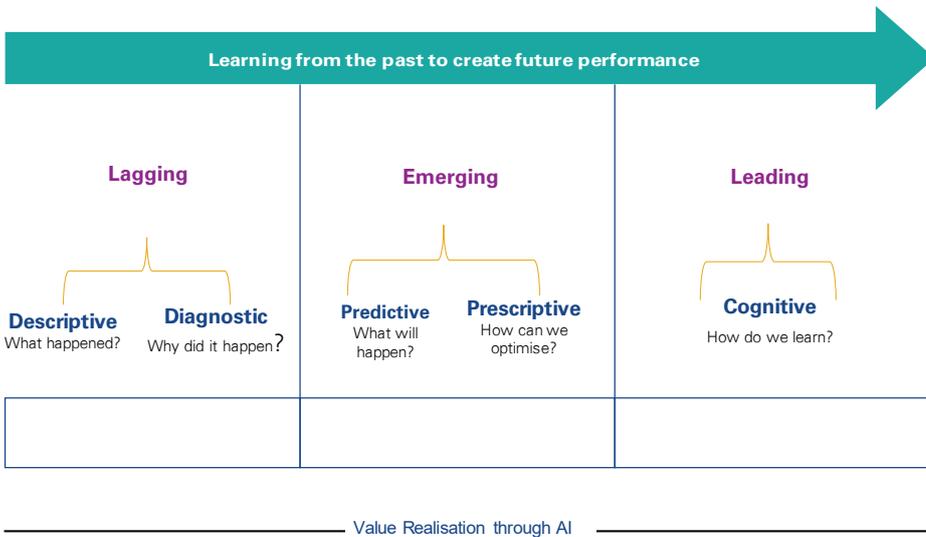
AI is the process by which machines, through the application of complex logic and algorithms, are programmed to analyze data, execute processes and formulate decisions in a way like the workings of the human brain. This can be achieved via various ways including learning (data and rules acquisition to facilitate information processing), reasoning (critical analysis for decision making), and the ability to correct one self and refine the learning process until a meaningful conclusion is reached.

AI has completely revolutionized the way we work, interact and go about our lives. However, the output of these algorithms will be inaccurate if humans are not involved in the training, tuning and testing of data for these algorithms (Human in the loop). In an increasingly crowded and competitive marketplace, businesses are shifting to AI-driven solutions (tools with proven algorithms) to solve their business problems and build an edge over competitors.



AI in the digital workspace

AI is constantly evolving, and at a fast pace too, which will lead to a future where machines will execute routine activities in a more efficient and effective manner compared to humans. This will lead to the eventual transformation of the workplace into one which will facilitate the co-existence of people and machines in a constant cycle of learning and self-improvement. With the ever-increasing volume of data and evolving sophistication of analytical capabilities, organizations can glean powerful insights and adapt to customer behavior based on real-time contextual events.



The practice of employing advanced analytical techniques and algorithms to train computers on utilizing data from a wide variety of sources with distinct formats to accelerate, automate, and augment business decisions that drive growth and profitability is termed Artificial Intelligence (AI)

With many businesses on the road to digital transformation, most executives guiding the journey don't trust the analytics that generate decisions within their organizations. The AI ecosystem enhances, accelerates, automates and augments decisions that drive growth and profitability.

Organizations can realize benefit from implementing AI for some process areas, but these processes should be part of a focused, strategic plan that aligns to business imperatives.

By integrating AI into businesses, potential problems can be detected and alternative solutions proposed by analyzing data and making informed decisions in real time.

AI accelerates business transformation, expands the spectrum of human cognitive and capabilities with more decisions shaped by machine-learning (ML) algorithms.



Industries being disrupted by AI

With the power to significantly increase productivity, redistribute labour, and create new sources of value, we have seen business value for cognitive and AI systems reach about \$1.2 trillion in 2018 – an increase of 70 percent from 2017, according to Gartner. AI-derived business value is forecast to reach \$3.9 trillion in 2022.

Businesses in need of greater security, more speed, and improved efficiency have embedded AI into their technology landscape. AI is also penetrating its way to every other industry where the application of intelligent automation can bring in far greater results.

The integration of AI to sales, marketing and HR etc. can create successful operations and bring in tremendous results even for entrepreneurial or small businesses.

The need to trust decisions generated by AI is important to businesses and organizations that utilize these technologies have responsibility for ensuring quality and integrity of data. Processing power has increased to the point where AI technologies are now able to simulate how a human brain learns, reasons, understands, and makes decisions.

Business Value of AI

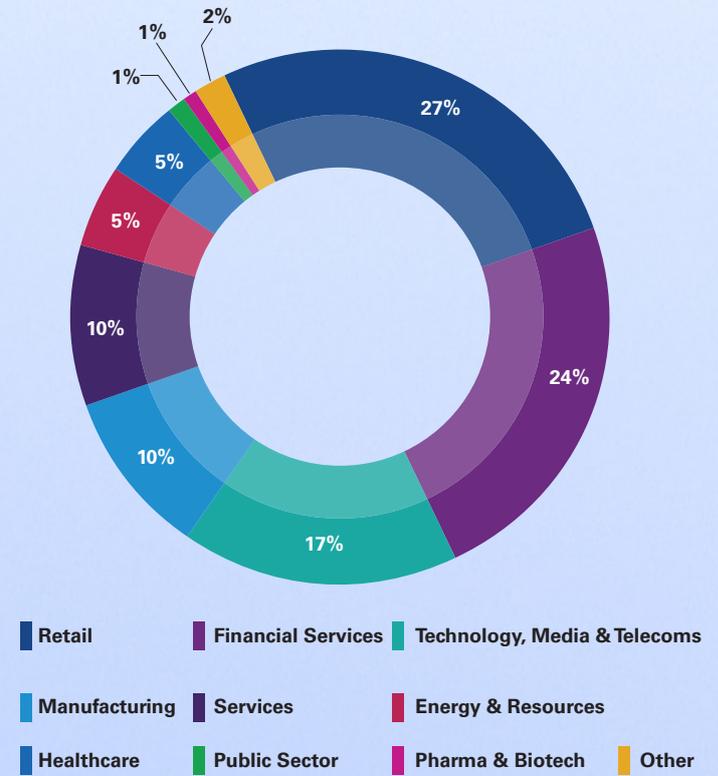
Top AI priorities for the next 2 to 3 years include customer and market insights that will refine personalization; driving sales and retention; back office and shared services automation to remove repetitive human tasks; finance and accounting streamlined to improve efficiency and compliance; analysis of unstructured voice and text data for specific functional use cases.

In addition, businesses can leverage AI to transform supply chain, improve distribution model and route to market thereby improving operations in an efficient and effective manner. These sources are centered on decision support and AI augmentation.

It is predicted that decision support and AI augmentation will deliver the highest benefit to businesses. Gartner estimates that AI augmentation will create \$2.9 trillion of business value and 6.2 billion hours of worker productivity globally in 2021¹.

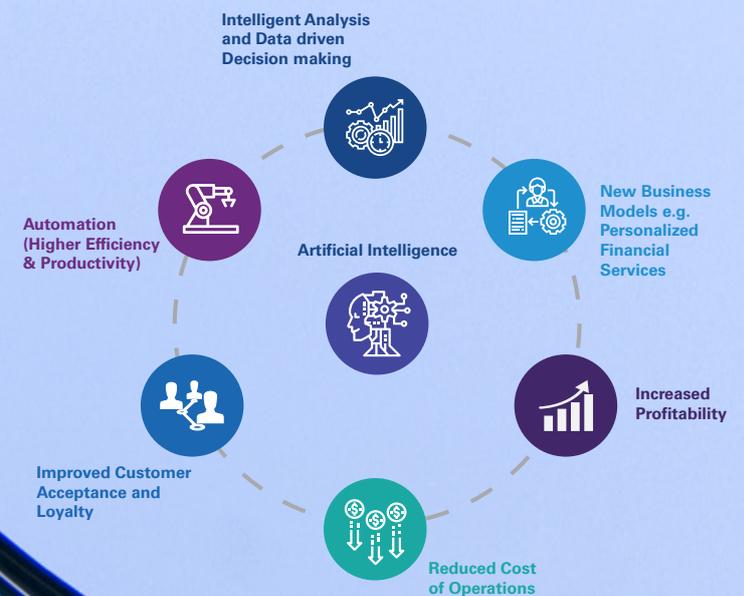
¹<https://www.gartner.com/en/newsroom/press-releases>

Breakdown by industry



Source: Global_Research_Mega_Trend_Cognitive_Computing_AI_Robotics

Value of Artificial Intelligence to businesses



AI and related technologies

AI has changed the way we think and interact with one another. It can perform this due to certain capabilities that enables its utilization in the digital workspace to provide more value for businesses. Since cloud and mobile technologies were introduced, AI is seen as the next sophisticated technology tool. It allows machines to think and learn like humans.

We live in the era of “big data” - an era with potential to collect huge sums of information that is difficult for an individual to process. In this regard, the use of AI has been quite fruitful using algorithms in several industries. We can classify AI in two key categories i.e. applied or general. Applied AI is more specific and more common – processes that are specialized such as stock and shares trading tools are in this category. Generalized AI is less specific as they can handle any task. However, they are less common than Applied AI. Ironically, this is the category which gave rise to the evolution of Machine Learning (ML) as some of the most recent developments are in this area.

The breakthrough in Machine Learning has been successful because of the rise in data available for analysis. ML has become a way of uncovering hidden value in large volumes of data.

As organizations continue to accumulate large volumes of data, more and more data is left unprocessed. Manual processing of data can be laborious and time-consuming; thus, many organizations end up processing only a small portion of their data, thus leaving valuable insights within the large volume of ‘unprocessed data’ to waste. This is where ML comes into play as it offers organizations the opportunity to glean valuable insights from large volumes of data that would otherwise remain unprocessed and overlooked.

Many business executives are intrigued by ML due to its ability to increase automation. However, its potential goes beyond just that. Specifically, ML algorithms can process extremely complex data at a rate that is exceptionally faster and more accurate than any traditional method. This outcome is especially beneficial to companies that process huge amounts of complex data and seek to identify peculiar patterns in situations related to customer churn, fraud, sales forecasting, call classification and many more.

ML, a subset of AI is slowly but inevitably influencing our daily lives.

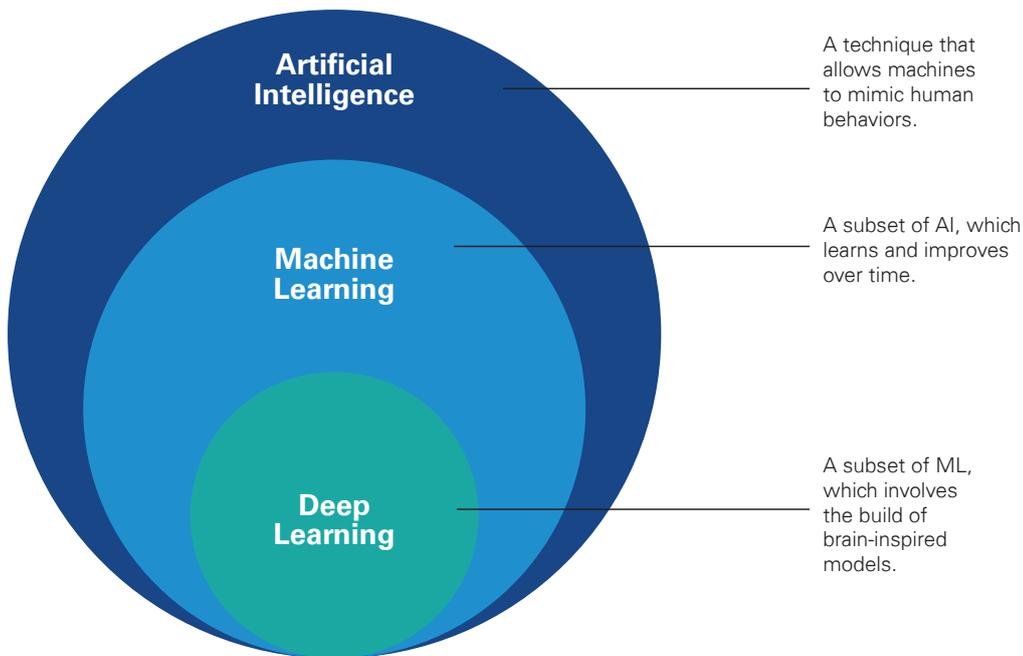
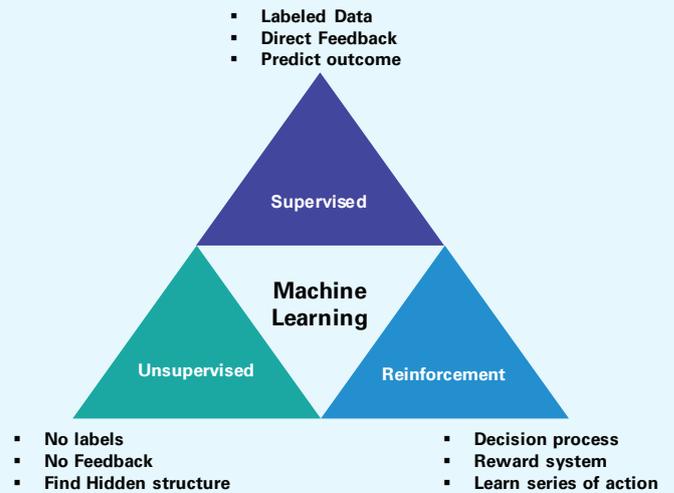
Businesses that use AI and related technologies to uncover new business insights “will steal \$1.2 trillion per annum from their less informed peers by 2020.”²

²<https://www.forbes.com/sites/gilpress>
(Referencing Forrester report - “Predictions 2017: Artificial Intelligence Will Drive The Insights Revolution.”)

ML has a way of bringing greater consistency to customer interaction.

ML has 3 different categories for the models:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning



There is a sub category of the ML which is Deep Learning (DL). It utilizes ML tools and techniques in unravelling thought-related problems. We see an application of DL with Google in its voice and image recognition algorithms to decide possible next steps.

The patterns for processing information in the human brain has influenced the algorithms utilized by DL. DL involves a computer system being fed with data and utilizing that data to reach a decision about other data. As systems became practical, a wide range of machine learning algorithms were conceptualized and developed into brain-inspired models of computation called Neural Networks.

3.0

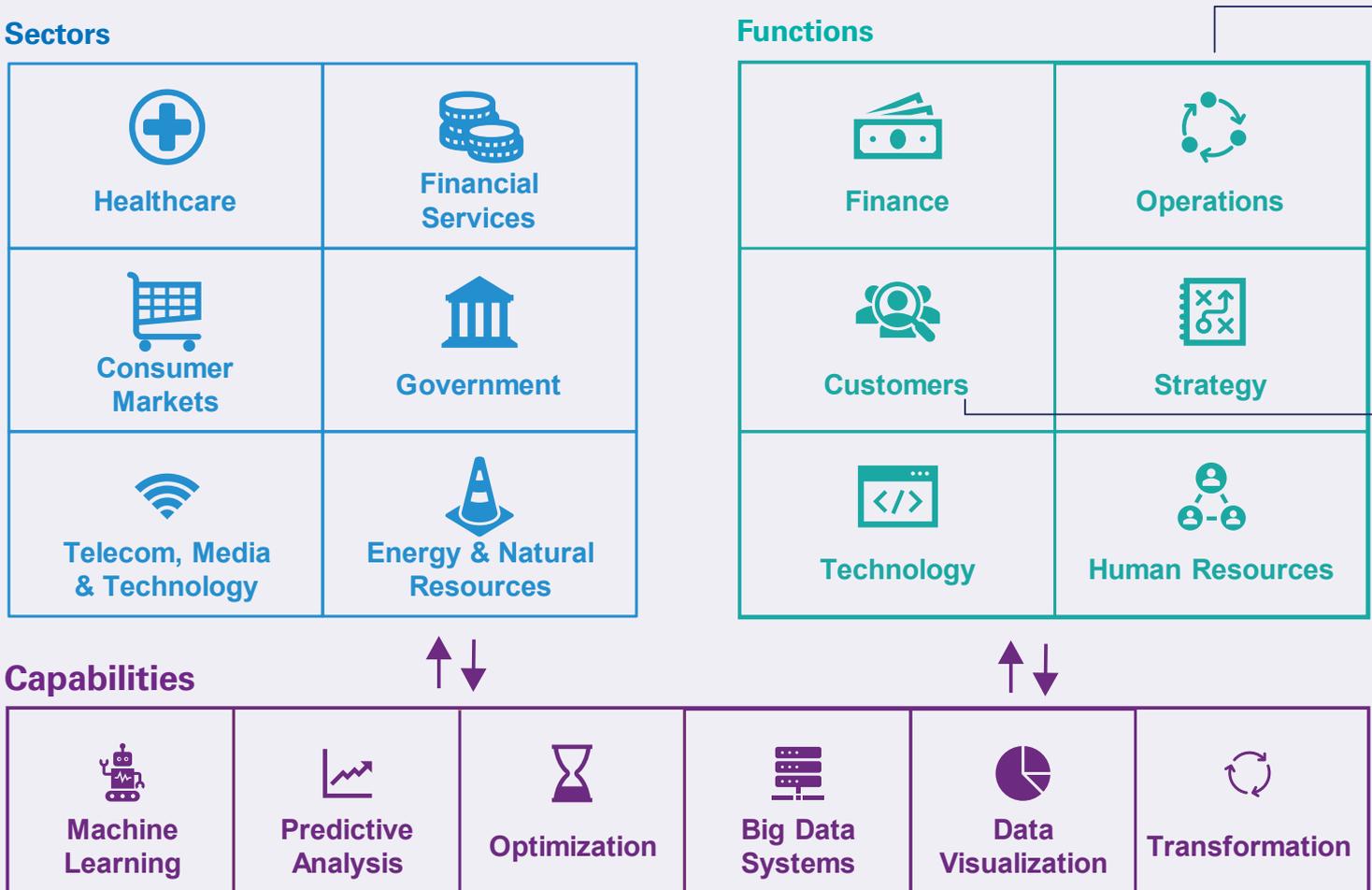
Unlocking the value of AI

Businesses are leveraging AI to drive revenue, growth and profitability. We conducted the KPMG 2019 Enterprise AI Adoption Study to gain insight into the state of AI and automation deployment efforts at select large cap companies. This involved in-depth interviews with senior leaders at 30 of the world's largest companies, as well as secondary research on job postings and media coverage. These 30 highly influential, Global 500 companies represent significant global economic value – collectively, they employ approximately 6.2 million people, with aggregate revenues of \$3 trillion. Together, they also represent a significant component of the AI market.

Feedback received from the KPMG 2019 Enterprise AI Adoption Study suggests high-priority areas for AI initiatives over the next two or three years include:

- Customer and market insights that will refine personalization, driving sales and retention
- Back-office and shared services automation to remove repetitive human tasks
- Finance and accounting streamlined to improve efficiency and compliance
- Analysis of unstructured voice and text data for specific functional use cases

Artificial Intelligence is sector-agnostic and function-verse



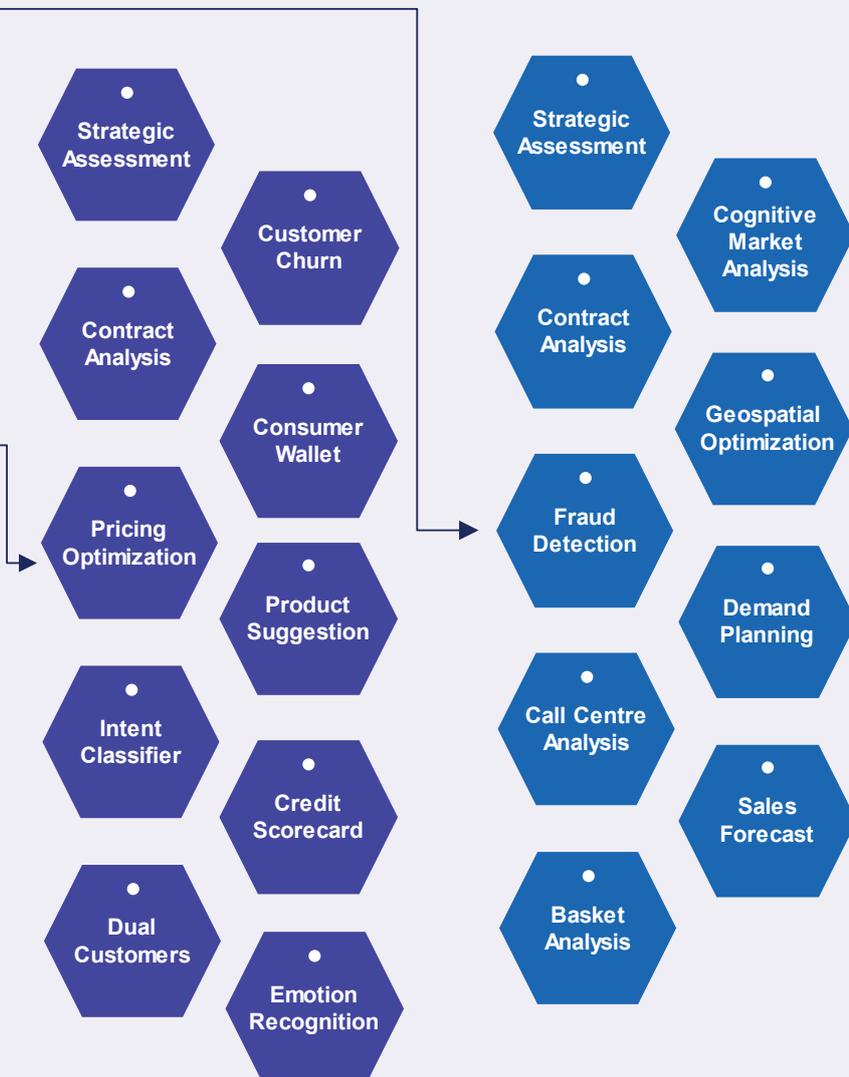
AI is sector-agnostic

There is a common misconception that artificial intelligence can only be applied in specific fields, especially fields closely associated with technology. What may not be readily obvious is that technology has already been embedded into most sectors, as a result, the potential for AI is everywhere around us. AI is heavily reliant on data, hence, as long as there is the presence of some form of data – structured or unstructured, there is the capability for AI to exist.

AI capabilities can be applied across functions

Within different business sectors, CEOs are embracing technological disruption. They now see practical applications for these technologies across the various functions within their business. These businesses can be reinvented (and are already being reinvented) by integrating AI with functions such as Sales (for sales forecast and demand planning), Finance (for credit processing and trading), Human Resources (for hiring procedures), amongst others.

However, true business transformation begins with a clear growth strategy; that is, a shared vision across all roles and functions followed by decisions on which AI technologies will align with the organization's values and objectives and how they will be integrated. Before deploying, you need to look at the business issues you are trying to solve and the outcomes you want to achieve.



The focus should be long-term

AI will play a major role in the development of new businesses and financial and operating models in the 21st Century as we see enterprise demands grow. Five companies from the Global 500 companies interviewed with the most mature AI capabilities have an average of 375 full-time employees working on AI. On average, they're spending an estimated \$75 million annually on AI talent. In summary, there should be an enterprise demand driving the use of AI technology for enterprise growth, profitability and sustainability across the board.

Unlocking the value of AI requires more than just technology, its power must be grounded on a foundation of trusted data and analytics, and proficiency in all critical business functions. Consequently, the long-term focus isn't about leveraging AI but taking the first step in the journey which include:

- Delivering the promise of AI is not possible without having 'humans in the loop'
- AI starts with no perspective, no point of view, no purpose. It requires humans to train, to test, and to tune
- AI must be cultivated, until it becomes a trusted core capability
- AI is fueled by data, highlighting the value of data to any organization

We believe competitive advantage gains with AI require much more than just technology. Deploying AI effectively across the enterprise requires a combination of the right talent and new organizational capabilities and processes that are driven through governance. Indeed, AI is closely tied to the overall shift in value creation through intangible assets, with organizational capital as a key feature. Organizational capital is made up of four core elements: human capital, values and norms, knowledge and expertise, and business processes and practices. These elements are required to create value for the enterprise. In deploying AI, companies should think bigger and embed data-driven technology broadly throughout the entire enterprise - automating, accelerating and enhancing key business processes to help transform at scale and drive value. The vision or strategy should be guided by innovative thinking – **with the long-term objective of enhanced, or new business strategies and models.**

Organizations must rise to the challenge or be disadvantaged relative to traditional and non-traditional competitors. Success in AI requires proficiency in all critical business functions. These critical business functions are:



1. Data expertise

- » Identify and maintain high quality data sources, both internally and externally
- » Ensure appropriate access to data sources
- » Enforce enterprise security standards, controlling access to data, including encryption, monitoring, back-up and recovery.
- » Centralize data management processes

2. AI technology

- » Establish a consistent set of AI, Automation and D&A tools
- » Leverage cloud infrastructure
- » Support the ingestion and analysis of Big Data
- » Intentionally build scalability of computing resources into the design to enable flexibility

3. Business process

- » Leverage AI, automation and D&A to improve productivity and build a competitive value chain
- » Automate decisions that include recurring processes
- » View analytics as a critical input in making operational decisions
- » Go beyond reactive reporting towards accurate forecasting and insights

4. Workforce

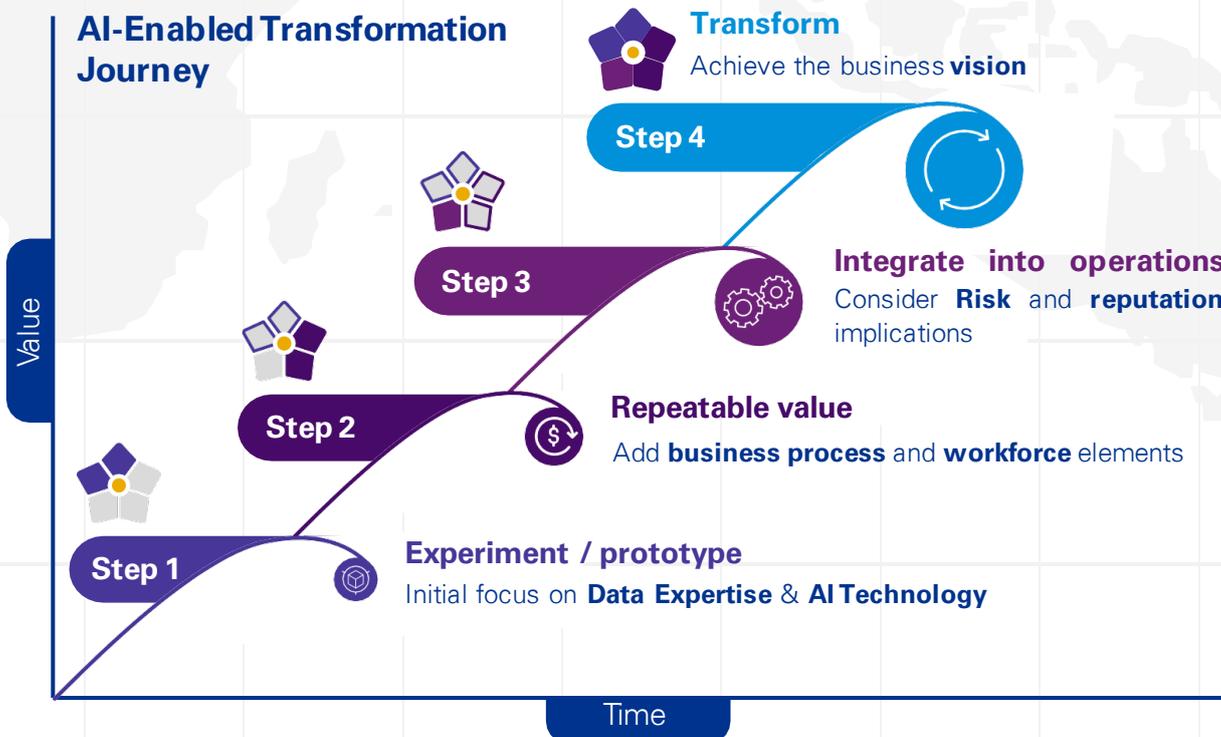
- » Ensure the right capabilities to implement the technology, leverage data, and change business processes
- » Implement transformed organization model through a strategic change management plan
- » Define standardized performance metrics
- » Consider implications of job changes on workforce

5. Risk and reputation

- » Involve all stakeholders in prioritization and scoping
- » Ensure comprehensive evaluation and compliance with regulations
- » Consider the impact of scope on external reputation and perception
- » Embed cyber compliance and safeguards

We realize that it's a journey to become AI-enabled

Solving strategic business challenges using AI starts with identifying discrete projects by continually innovating and developing powerful solutions that seek to bring AI to life. Many organizations take a step-by-step approach with discrete projects or use cases that demonstrate business value, building AI capabilities along the way.



Data remains at the center of successful AI strategies, hence, it is imperative that data storage mechanisms are optimal and ready to support AI initiatives.



Data-driven capabilities transform businesses



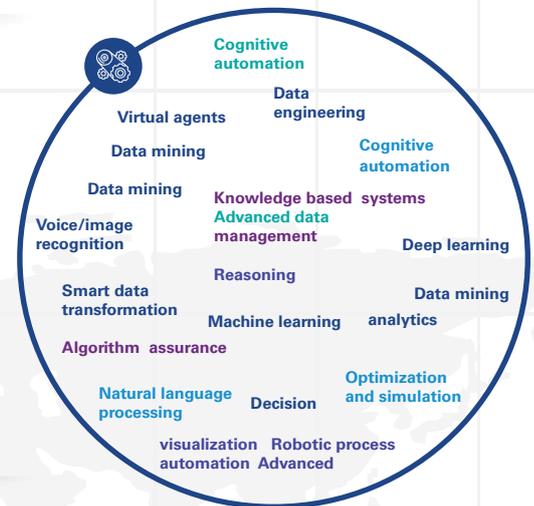
Unlocking the value of your data starts from identifying the various sources of data and distinct formats



Embrace analytics to gain new insights and enable you to make better, faster and more confident business decisions.



Leverage AI to help you enhance, accelerate, automate and augment decisions while keeping the 'human in the loop'.



To achieve digital transformation aspirations, a growing number of businesses across several industries are making huge investments in AI and have started harnessing its capabilities. However, a lot more can be done with the application of artificial intelligence. This begins with embracing a new strategic mindset that revolves as much around people, process, and structure as it does around technology. Many businesses are currently using AI to drive insights and proactively determine opportunities using data analytics.

Tencent (a Chinese conglomerate) launched the AI Medical Innovation System (AIMIS) in 2017, which is AI-powered, AIMIS utilises predictive modeling to provide insights to the diagnosis of patients based on input from tens of thousands of anonymized patient data used to develop its AI-diagnostic component. Hospitals in China have rapidly adopted this technology as it currently boasts of high accuracy rates in early diagnosis. AI must be cultivated until it becomes a trusted core capability. And it is not, counterintuitively, just about technology; it is, truly, about ML from humans and the value is only realized with the "human in the loop".

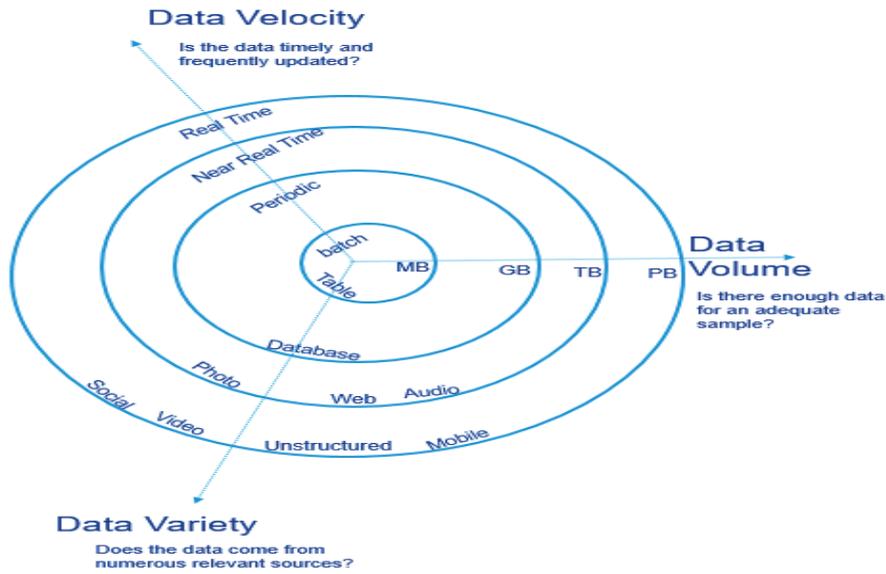
Data is Driving Intelligence.....

On an ongoing basis, organizations acquire and process data coming from their customers, employees, partners and other sources. However, leading businesses are relentlessly considering tools and techniques that can leverage these data in addressing their needs and gaining a competitive edge. Data is raw material that becomes valuable through the use of analytics.

Analytics using big data, specifically from connected platforms, is transforming businesses. In recent years, companies with a pure data-centered strategy have rapidly disrupted the transportation, entertainment, tourism and financial services sectors. But that doesn't imply that legacy businesses can't catch up with the data-centered leaders. Many of such businesses are starting to invest in a connected democratization of data as they realize that the vast quantity of unstructured data (which comes from multiple sources such as emails, documents, images, videos, blogs, social media, etc.) now being produced and collected requires a new mindset if they are to stay competitive. Selecting the right technology and having the right business understanding is vital to deriving insight from data

Data is the oil of the 21st century and analytics is the combustion engine¹

¹ Gartner



AI is reinventing how businesses operate, compete and thrive. One of the most visible applications of AI is in Chatbots and intelligent assistants that interact with people via voice or text channels. AI has become essential to competing in today's marketplace—for predicting what internal and external customers want and discovering how to serve them with more rewarding and personalized experiences.

Harnessing the value of AI spans beyond technology, its power must be grounded on a foundation of trusted data and analytics (process and structure), and deep-rooted domain knowledge (people). This can be achieved either through any of the following:

Machine Learning

AI can provide an unmatched level of decision support and operations by identifying patterns and possibly acting on them in real time to drive new revenue opportunities, improved sales margins, provide greater customer satisfaction, more accurate micro-market trend prediction etc.

Human cognition and learning capabilities

This vision of AI expanding the spectrum of human cognition and capabilities is achieved when the technology is paired with the ability of humans to develop and train the algorithms to address specific problems. It also enables humans to achieve and manage precise consistency.



Building trust in AI-enabled analytics

Effective analytics are grounded in four anchors of trust



Building trust in AI-enabled analytics is founded on four key anchors — quality, effectiveness, integrity and resilience. However, before companies begin to build this trust, they must first overcome the thorny challenges around data.

Organizations must devise means of ensuring that their AI solution can ‘unlearn’ data. For instance, if a certain legal position was previously accepted as appropriate but no longer is, as the result of a specific case, that data point must be excluded from the AI’s ‘memory’. To some extent one can design solutions with such flexibility in mind, but that would only apply to aspects that people at that time consider to be a variable.

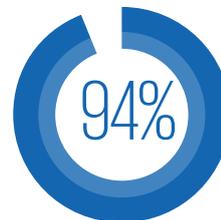
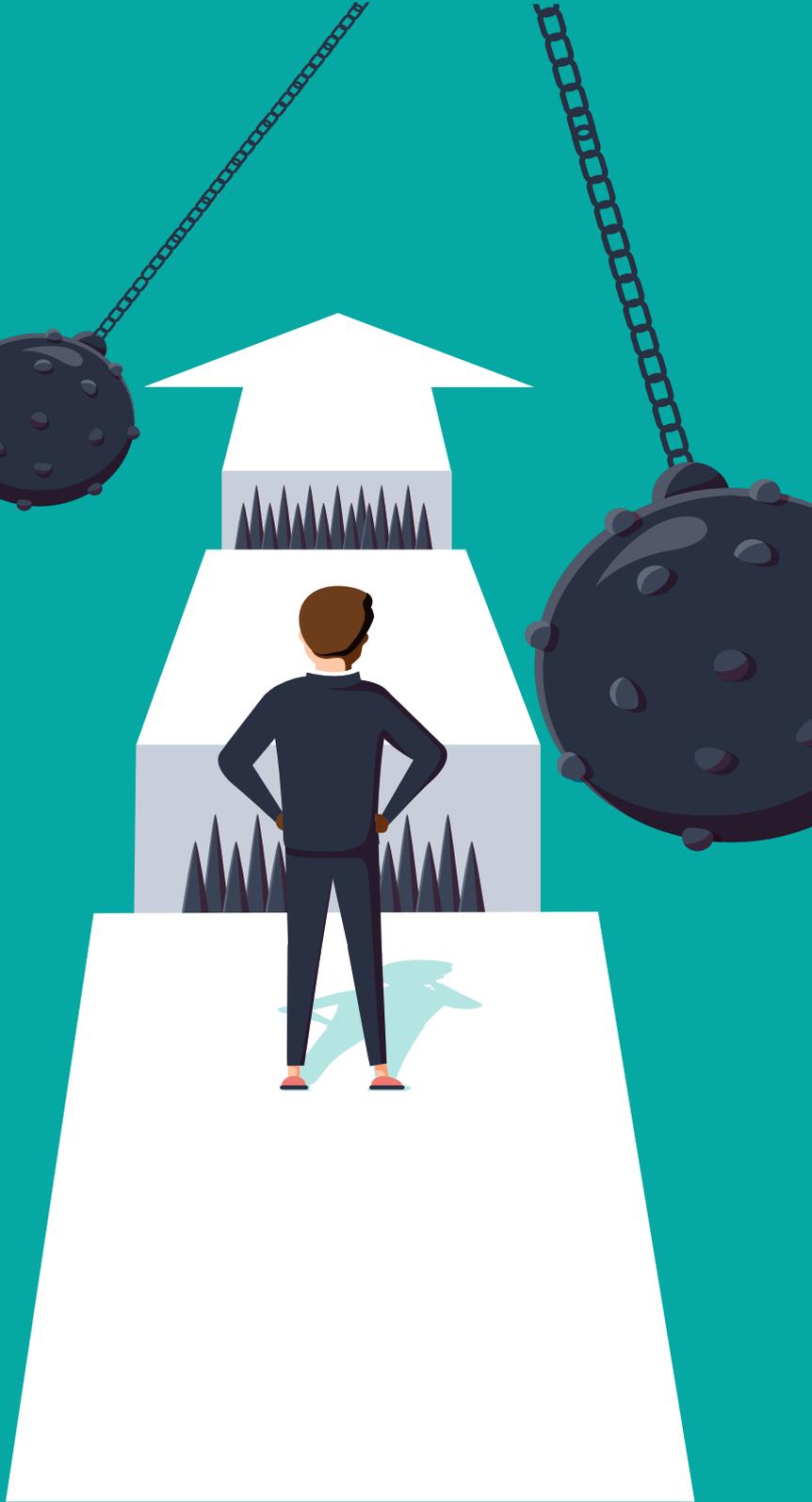
In addition, to also ensure that organizations are satisfied with the quality of the data feeding an AI system’s learning and decision-making process, there must be a level of rigor around the selection of data used to feed the AI system. For AI to be deployed successfully, organizations and businesses need to be able to trust it to make the right decisions. We believe the three approaches to achieving trust in AI solutions are as follows:

- Comparing outcomes with other sources
- Understand and validate the AI models
- Develop AI solutions in a controlled environment



AI adoption is accelerating but there is a unique set of challenges

Business leaders need to arm the workforce for a new 'machine age' of artificial intelligence and increasing automation. The charts below represents information obtained from survey results by KPMG, IDC and IBM.



of companies believe AI is key to competitive advantage.

- IDC



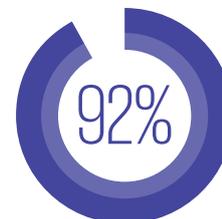
see regulatory constraints as a barrier to implementing AI.

- IBM / BV AI 2018



only have a high level of trust in their own organization's analytics.

- KPMG's recent Guardians of Trust report



question trustworthiness of data, analytics ... are worried about the impact on reputation.

- KPMG's recent Guardians of Trust report

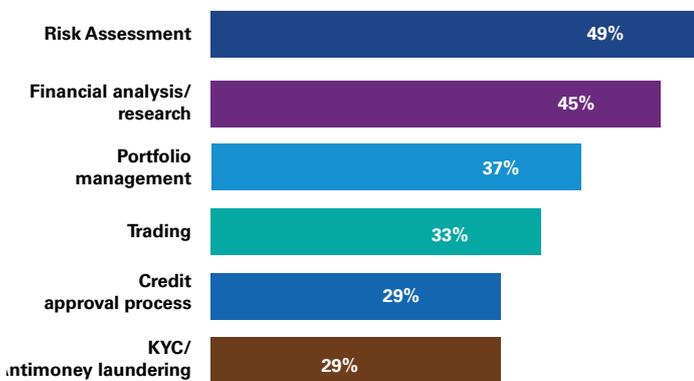


1 in 20 companies has extensively incorporated AI in offerings or processes.

- MIT Sloan Management Review

AI adoption in Financial Services – Global Outlook

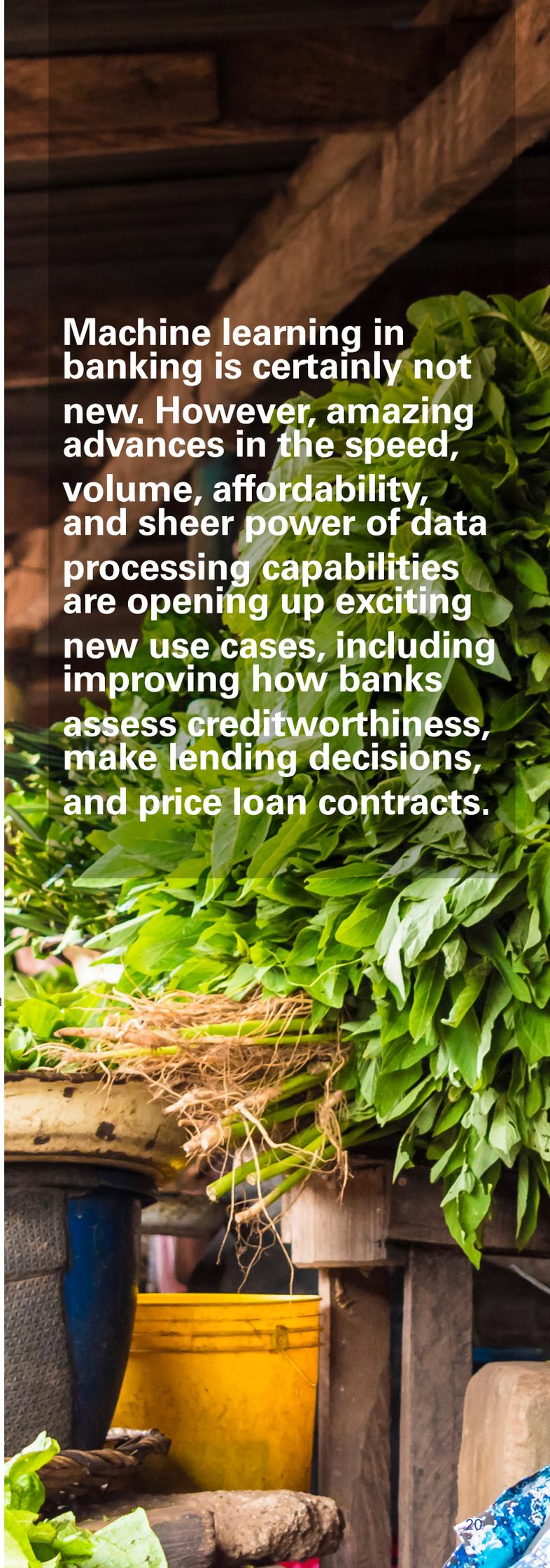
Application of AI in financial services



Automation and analytics are driving the adoption of AI in financial services. However, businesses need to overcome challenges including gaps in skill availability, lack of regulations, security concerns and high cost. Banking and big data go hand in hand. And that is exactly why Machine Learning fits like a glove across many areas within financial services, especially credit risk modeling. MLs advanced algorithms can sieve through enormous amounts of structured and unstructured data to provide insights that enable better credit risk decisions, improve data monitoring, provide alerts on potential problems, detect fraud, and enable better forecasting with predictive analytics. Such information arms banks with active intelligence for credit risk management, as well as many other areas.

Many fintechs seized this opportunity early on, wasting no time embracing machine learning to invade such traditional banking turf as lending. A TransUnion study shows fintech lenders’ dramatic rise in market penetration in the personal loan space. In 2017, fintechs represented 32 percent of all personal loan balances, up from just 4 percent in 2012. We believe credit risk modeling is an area ripe for machine learning adoption and is therefore the first area where banks should focus their technology enablement efforts. Precise credit risk modeling depends on the complex analysis of tremendous volumes of data from a variety of sources. Using traditional modeling techniques over machine learning algorithms may not achieve the anticipated benefits because the traditional models are tedious, time-consuming, and often prone to error.

Machine learning in banking is certainly not new. However, amazing advances in the speed, volume, affordability, and sheer power of data processing capabilities are opening up exciting new use cases, including improving how banks assess creditworthiness, make lending decisions, and price loan contracts.





Banks can set the pace for AI adoption

From strategy to customer experience, banks are committed to adopting AI and data-driven methods across their operations.

As a result, banks have been enthusiastic adopters of data analytics technologies. But our research shows that bank executives are frustrated with how long it takes to get actionable insights from AI and big data analytics. And they aren't confident of the results when they get them. But not all problems need massive data analytics projects. By using smaller data sets and agile approaches, banks can get the answers they need in time to act while they continue to develop advanced data analytics capabilities.

Based on the bank executive survey, as well as research and work with clients across industries, we see a common cause of frustration with data analytics. In a bid to build AI models and robust data analytics operations, companies create costly and overly complex systems where simpler models can be bought, copied or simply built.

The truth is that complex problems don't always require complex technology solutions. In our experience, companies can get to actionable insights more quickly by being agile and small. Rather than building a massive all-purpose data analytics capability, start with a single strategic problem and scale up the solution.

Invest in data

Organisations use smaller data sets in improving AI algorithm or model. By deploying smaller teams using smaller data to explore and test multiple hypotheses using an accelerated, agile methodology. Banks can generate significant momentum, putting insight after insight into production—and moving the business ahead faster than ever before. The incremental profits generated by rapid data analytics can fuel a powerful investment flywheel, with the potential to generate additional value with each cycle. It is also expedient to collect and store data from both internal and external sources related to the specific use case businesses seek to solve. Data is a fundamental building block for getting value from new and emerging technologies like AI. And our experience suggests that most financial institutions will need to continue to invest heavily in ensuring their data is reliable, accessible and secure. This is not just about feeding the right data into the machine; it is also about helping to mitigate

operational risks and potential biases by verifying the quality and integrity of the data the organization is using.

How to be agile

The agile method is fast and flexible because it breaks problems down into small pieces, uses an iterative “test and learn” process to fine-tune hypotheses, and balances speed with a degree of accuracy. This might be broken into several sprints—one for collecting and cleaning data, another to identify key variables, a third to model the data, and a fourth to run the analysis. Using the agile method, a data analytics team would develop and test a hypothesis in the first round of analysis, then review results, adjust the hypothesis and try again. Through a test-and-learn process, the team refines the model and tries different variables until it gets satisfactory results. By contrast, analytics efforts that begin without a hypothesis have nothing to test, much less to refine. They can be unfocused and unlikely to yield meaningful insights.

This helps banks and other organizations react quickly to shifts in customer needs and—more importantly—detect when preferences are changing before it is obvious. By quickly developing insights that are somewhat less accurate, but directionally accurate, a bank can pounce on opportunities and achieve superior speed to revenue with new initiatives.

A quick win: Using data analytics to find the best sites for new bank branches

A bank wanted to improve its model for identifying locations for new branches. It asked KPMG to develop a model using internal and external data to predict performance at potential locations.

Using an agile approach, in six weeks, the bank developed a machine learning model to project branch performance metrics including revenue and deposit growth. The model used more than 2,000 external data points, including customer behavior and real estate data.

The analysis helped the bank identify the top 20 external data points that drove the actual financial performance of new branches and significantly improved the accuracy of the bank's site selection process. In addition, the team was able to provide a way to analyze commercial real estate vacancies to prioritize potential new locations

²sloanreview.mit.edu

Why trust in analytics is faltering

In a recent KPMG survey of banking executives in the US from global, national and regional institutions, we found that respondents were less likely to trust advanced analytics techniques, such as artificial intelligence (AI) and machine learning. The only methods that respondents trust implicitly are Excel spreadsheets and traditional statistical techniques such as correlation and regression.

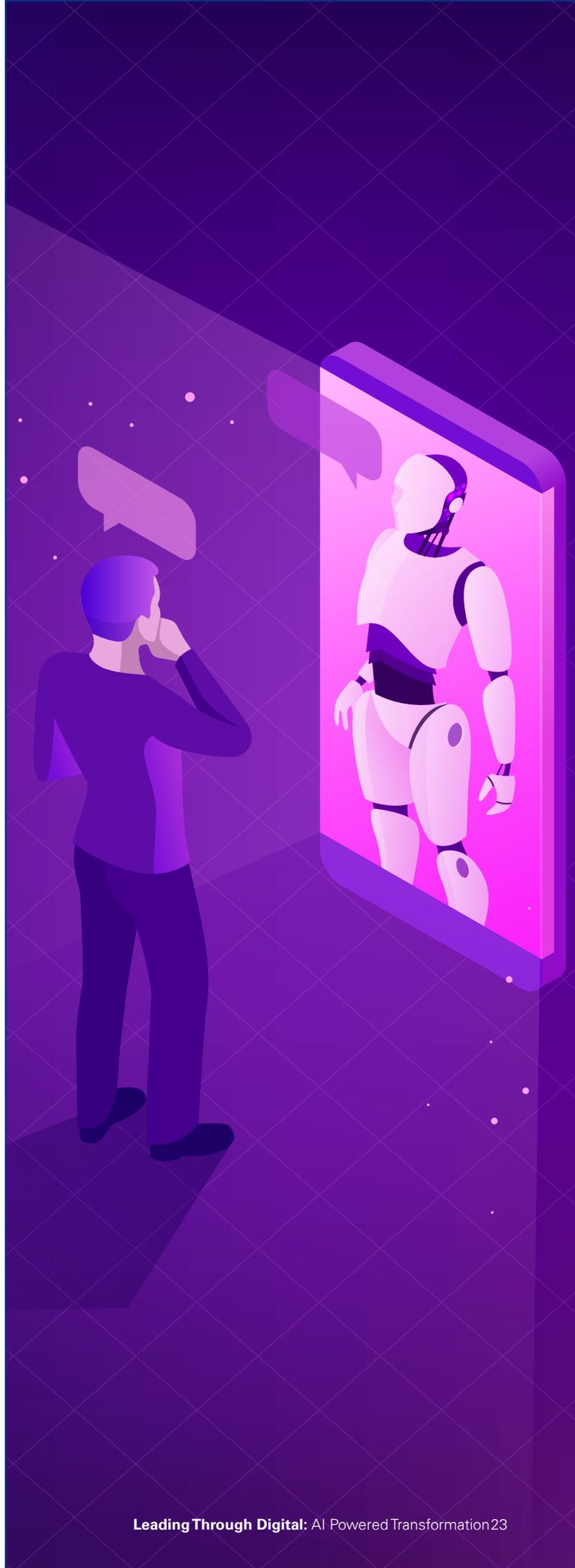
Not surprisingly, they were far more likely to use these trusted tools—and they were least likely to use the most esoteric methods, such as cognitive computing. Sixty-five percent say they eyeball charts and graphs to discern patterns and trends.

The fault is rarely with the technology itself. Using newer techniques such as machine learning and AI effectively requires education and familiarity. To develop trust in new methods and set reasonable expectations, executives and other decision-makers first need to learn something about how the technology works. This is the foundation for the organizational support that successful advanced analytics functions need.

Looking ahead

While there are still significant unknowns about the future evolution of AI and its associated risks, there are a few things that we know for sure: financial services firms will continue to develop and deploy AI across the organization; new risks and compliance issues will continue to emerge; and risk management and business functions will face continued pressure to ensure that the AI and associated risks are being properly managed.

The reality is that — given the rapid pace of change in the markets — financial institutions will need to be able to make faster decisions that enable the organizations to move from ideation to revenue with speed. And that means they will need to greatly improve the processes they use to evaluate, select, invest and deploy emerging technologies. Those that get it right can look forward to competitive differentiation, market growth and increased brand value. Those that delay or take the wrong path may find themselves left behind.



AI use cases in financial services

Financial institutions such as banks utilise AI algorithms to detect suspicious activity, including fraud, credit decisions, risk management, trading, personalized banking and process automation. Some of the use cases extend to robotic process automation. The application of RPA varies from streamlining account opening process to improving dispute resolution process, thus avoiding revenue loss.

Robo-advisors, which use complex mathematical algorithms and are fast replacing traditional financial advisors to provide

digital financial advice, are also becoming commonplace.

Stock trading quants also make use of simple or complex models to identify and maximise potential trading opportunities. More importantly, DL, ML and other AI tools also enable institutions to understand their customers and respective situations at a deeper level. This is done through the application of predictive analytics tools that can gauge when a customer needs a credit facility or is considering switching financial service providers.

With the increasing availability of data content and evolving sophistication of analytical capabilities, banks can glean powerful insights and adapt to customer behaviour based on real-time contextual events



1

Customer is shopping for a new car and has **visited several local dealerships**. Mobile app captures his geolocation and streams that data to the bank in real time. Recent **web browsing data** indicates that the customer has browsed auto loan and car dealership websites like Jiji and Cheki. **Customer 360** profile shows several **key indicators that he is in the market for a vehicle**, including his life stage, current balance, geolocation.



2

Bank uses geolocation history, web browsing history, and customer 360 profile indicators to determine that the **customer is a prime candidate for an auto loan offer**.



3

Data Model automatically generates auto loan offer, **leveraging local loan rates and customer insights** such as current balance, creditworthiness, and lifetime value.



4

Customer receives alert via mobile app with a competitive **preapproved offer** for an auto loan showing a competitive rate.



5

When customer decides to purchase a car, he **reviews loan offer** from the bank. **Customer selects bank's offer** due to lower rate (driven by customer insights) and existing relationship with bank. Customer then follows on-screen prompts to enter vehicle information to complete process and obtain loan offer

Technology, Media and Telecommunications

- Customized content creation
- Personalized marketing and advertising
- Media Archiving

Health Care

- Predictive diagnosis by analyzing and detecting variations in patient data
- Early identification of potential pandemics
- Imaging diagnostics
- Predictive equipment maintenance

Supply Chain

- Demand Forecasting and Inventory Management
- Logistics and Relationship Management
- Virtual Assistants

Financial Services

- Personalized financial planning
- Fraud detection and anti-money laundering
- Automation of customer operations



Energy

- Smart Metering
- Predictive Infrastructure Maintenance
- Efficient grid operation
- Efficient energy generation and distribution

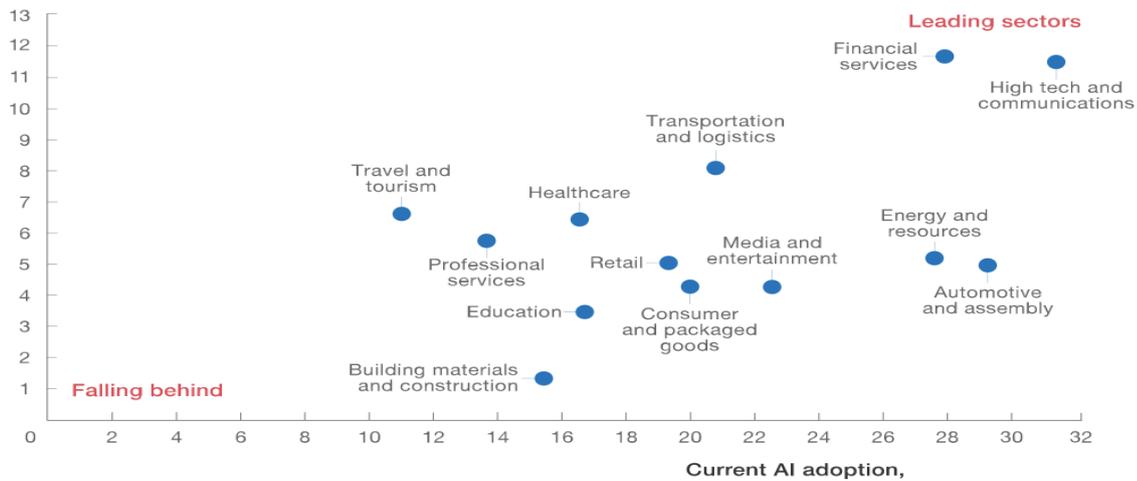
Retail and Consumer

- Anticipating customer's demands
- Customer Segmentation
- Inventory and delivery management

Transportation

- Autonomous trucking and delivery
- Traffic control and reduced congestion
- Enhanced security

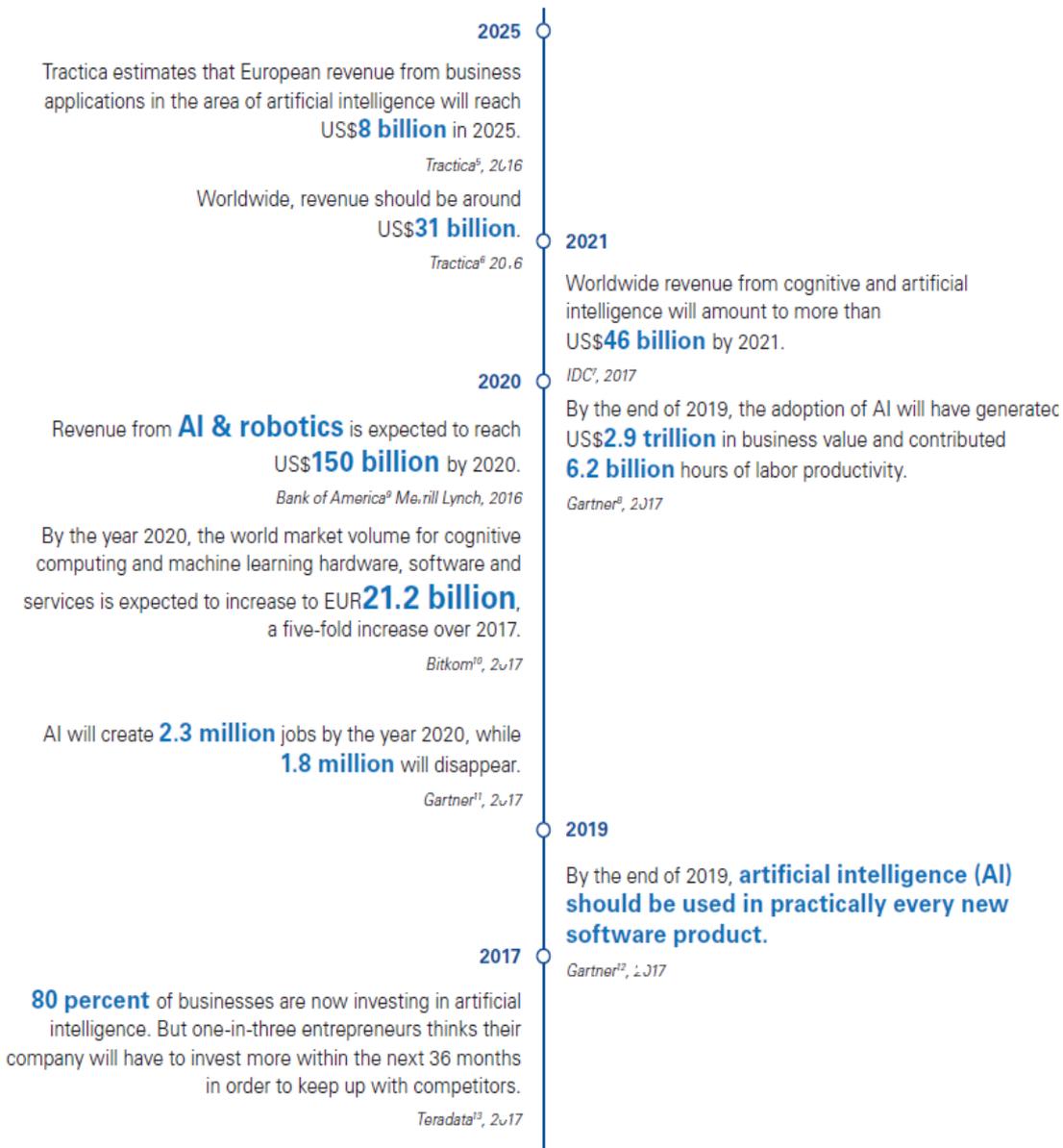
Future AI demand trajectory,



Follow the Money

As with all new technologies, it is nearly impossible to confidently predict the overall potential of AI. However, to offer a well-rounded view of future developments and their possible effects, we compiled a range of analyst and corporate assessments of the revenue potential of AI applications. What we found was a range of opinions on how the monetary potential of AI could be identified.

Anticipated Revenue of Potential AI applications



Just how Pervasive is AI at Amazon?

It's been there from the beginning

The utilization of Artificial intelligence at Amazon isn't exactly a recent occurrence. A book recommendation system was one of the initiatives pioneered by current CEO of consumer services, Jeff Wilke, as an attempt to improve the firms' operational efficiency³. However, this initiative was undertaken at a time when Amazon was primarily known as an online book store. As Amazon broadened and diversified its scope of operations, its utilisation of AI also deepened and became more pervasive. In addition to applying the recommended technology to other products, the firm has also applied AI technology to several other key processes within its various businesses. Amazon doesn't just utilize AI for its operations; it also offers cloud-based AI platforms to its customers and is regarded as one of the most prominent providers of cloud-based AI services. Notable users of Amazon's platform include NASA, Intel, Toyota and Capital One amongst others.

How Amazon boosts its operational efficiency with AI

An important part of Amazon's online shopping business is its fulfilment centres which are warehouses where items purchased by its customers are stored and eventually dispatched from. Amazon utilized AI to improve the inventory management process at its fulfilment centres. Specifically, Amazon utilized computer vision technology in conjunction with AI to track and record the location of various items within the warehouse. Amazon also utilizes a similar method to run its cashier-less chain of grocery stores⁴.

A Dark Turn

The use of AI at the tech giant has not been without controversy. It was discovered that after an AI-based CV assessment system was employed to screen the applications of several applicants, after being trained with ten years' worth of recruitment data, numerous applications by women wound up getting rejected as the AI system developed a bias due to hiring trends over the past ten years favouring male applicants⁵.

AI's usage within Amazon



³<https://www.economist.com/business/2019/04/13/amazons-empire-rests-on-its-low-key-approach-to-ai>

⁴<https://www.fastcompany.com/90246028/how-ai-is-helping-amazon-become-a-trillion-dollar-company>

⁵<https://www.theguardian.com/technology/2018/oct/10/amazon-hiring-ai-gender-bias-recruiting-engine>

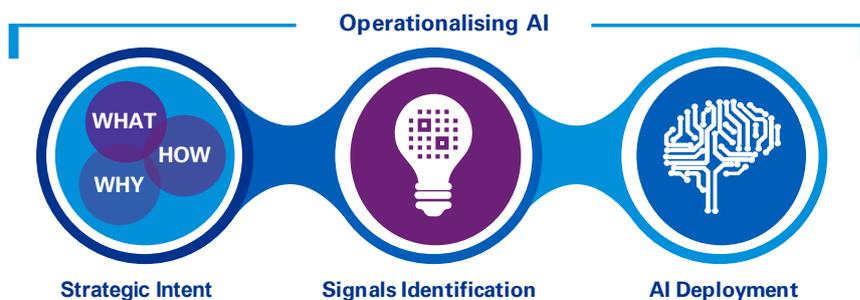


4.0

Operationalizing AI



How do I deploy AI?



One of the ways to operationalize the AI strategy is by incorporating AI models in business applications to drive intelligent actions. These models have no tangible business benefits until they are operationalized.

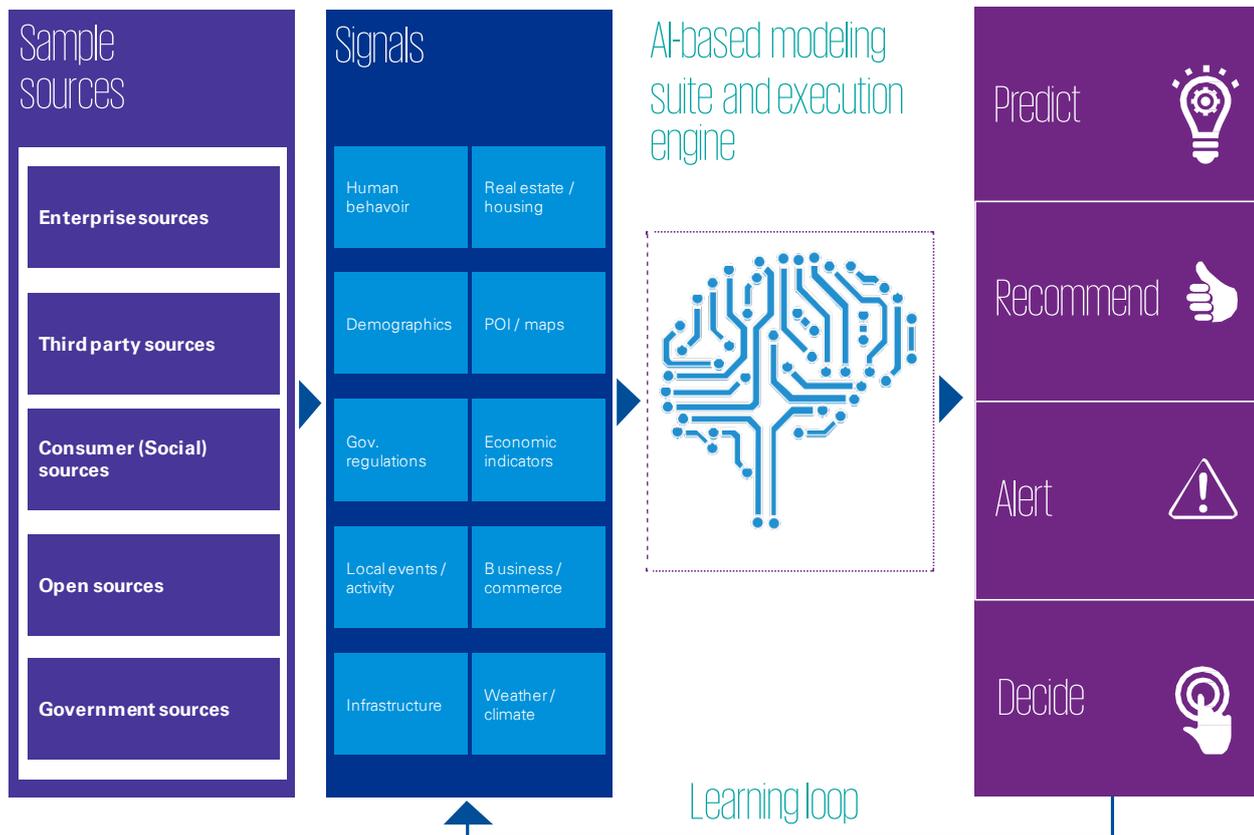
An AI project kicks off after identifying the areas in which AI can benefit your business. These can be done by thoroughly examining all processes within your organization to identify areas of great opportunities and strategic intent. These include business use cases such as a process to be improved or a business problem that needs to be addressed.

Every solution has a unique value proposition aimed to solve a specific business problem. However, to get the most value from AI, organizations must continuously harvest a broad variety of signals from public and private sources for the business challenge they are trying to solve. These signals are then used to fuel decisions, trigger alerts, and generate recommendations. **Signals are not simply data – Signals are business parameters that drive the outcome or insight we seek to achieve.** These signals can be spread across multiple layers, such as, market signals, product signals, customer signals, etc. However, the big challenge is finding the right signal that can drive optimal business decision.

Uncover the signals that matter to your business

The universe of data is growing at an exponential rate and cognitive and predictive systems are hungry for more. The big challenge is finding the signals that drive optimal business decisions. By leveraging the latest decision science, you can build Signals Repository to continuously harvest a broad variety of signals from public and private sources which will help organizations get the edge in their decision-making.

By creating a 'big data fabric' of exogenous and endogenous data, organizations can find the right signals to enable their AI and machine learning technologies to achieve unprecedented accuracy in predictions and business execution outcomes.



Listening to all signals...

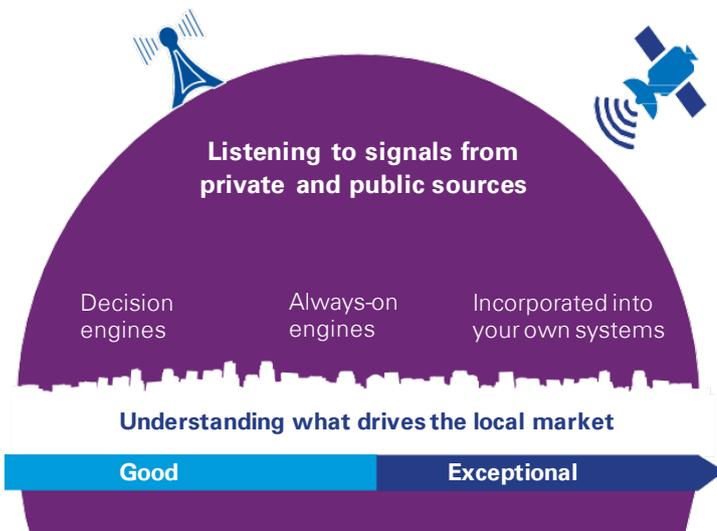
To optimize any business activity, you need to understand all the data available to you - from your own internal and customer data to competitor and market data. KPMG works with organizations to identify and collect the right signals from the growing universe of data including:

Structured data

- Government statistics / data
- Financial data / performance
- Locations
- Competitor price
- Socio-economics
- Weather
- Pricing and strategy
- Customer profitability
- Promotions/offers
- Website
- Product or services catalog

Unstructured data

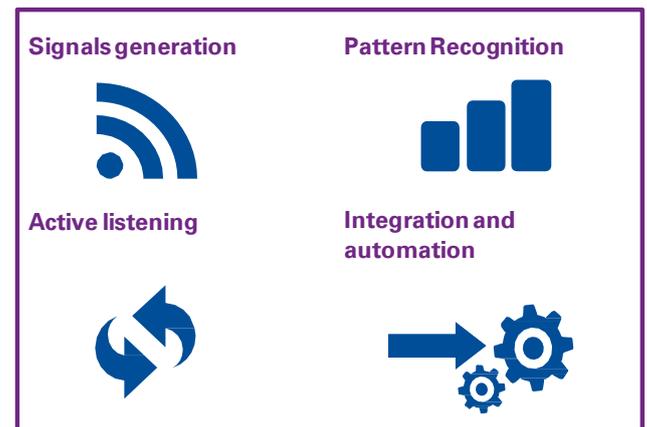
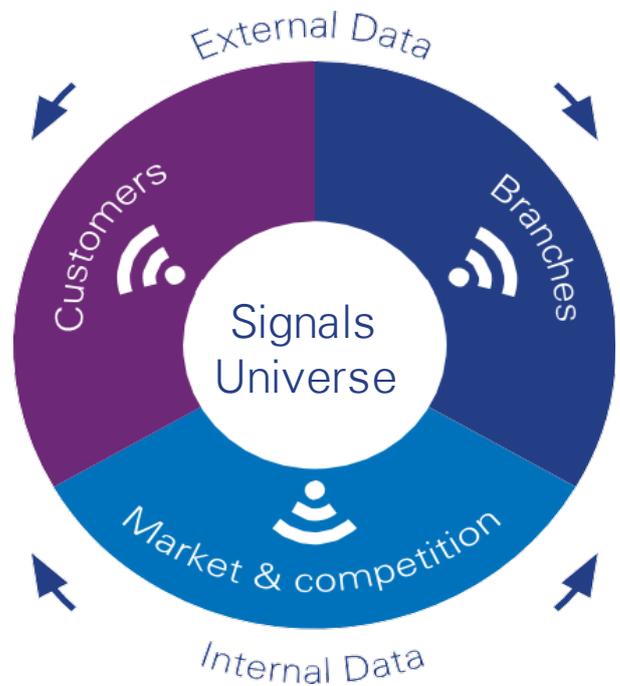
- Tweets and social commentary
- Regulation
- News and press
- Competitor information
- Business plans
- Market research
- Technical advice
- Internal reviews
- Conversational metadata



Listening to all signals... to help turn data into value

Combining the signals harvested from sources can help organizations enrich their signals repository to create linkages and associations that enable decision-makers to understand and assess highly predictive variables.

Using a highly-integrated and data-driven approach, changes in key signals and their impacts can then be monitored to ensure the latest and most accurate insights are derived.



e
Z":
e
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add back the deselected mirror modifier object

```
active = modifier_ob  
frier_ob)) # modifier ob is the active ob
```

```
l_objects[0]  
selected = 1
```

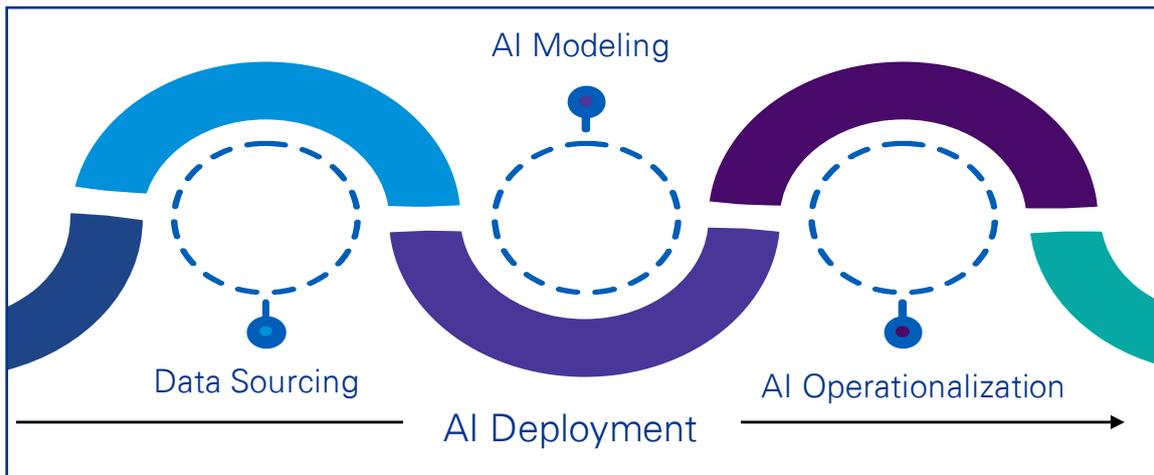
```
objects = objects + [modifier_ob]
```

```
selected = 1
```

```
objects = objects + [modifier_ob]
```

```
objects = objects + [modifier_ob]
```

Embedding AI into our Businesses



Unlike other traditional application development projects, deployment of an AI model does not involve the usual build, test or deploy phase, rather it involves three major phases.

- Data Sourcing (data collection, cleaning and transformation).
- AI Modelling (Model creation and evaluation)
- AI Operationalization (deployment, monitoring and retraining).

Data Sourcing

Being a data-driven technology, it is important to identify the data source and ensure that this data (which will be used to train the AI model) is appropriate and as clean as possible i.e. the data should be in the right formats and structure, in the right quantity and with reduced noise/outliers.

Any application of AI will only be as good as the quality of data collected. Hence, data sourcing will involve collection, cleansing and transformation of data to suit the AI model.

1. Data Collection:

This involves the collection of all data relevant to AI model. Data collection could involve the extraction of large and historic data which may be structured or unstructured from a wide range of sources. The data should be centered around the use case(s) with historic records.

2. Data Cleansing & Transformation:

Data is stored in various formats throughout various systems, hence, it is pertinent that this data is converted to a common format (cleansing) and imported into a common system where it can be used to build AI models. Data extracted from various sources are cleansed and transformed utilizing routine programs and labeled for specific AI models. The output of this data transformation is used to train the AI model.

Asides data cleansing, it is also important that businesses have right data about the business use cases. They also need to make sure the gathered data captures all the data variables and contexts that are impacting the business use cases. Companies who are currently dominating the AI space and reaping benefits of predictive and prescriptive analysis are companies who were the first to begin building and utilizing their data sets such as Google, Amazon and Facebook.

AI Modeling

1. Model Creation:

The AI modelling phase focuses on creating a trained AI model. The initial step in AI model creation is first determining the machine learning algorithms to be utilized in training the data. This include identifying the required ML algorithms. The process of training an AI model, therefore, involves providing a learning algorithm with training data to learn from.

The training data must contain the input data and the expected output data which is known as a target or target attribute. The ML algorithm is expected to find patterns in the training data that maps the input data attributes to the target/ expected output (the outcome that you want to predict).

The learning algorithm is controlled via the training parameters which is inputted to control certain properties of the training process and the resulting ML model.

This final output is a trained model that captures these patterns which may be an input for determining new data sets.

Training models usually requires significant time to finalize which is the concluding phase of AI modeling. The goal of the trained model is a model that makes the best predictions and matched your business requirements and use cases.

2. Model Evaluation:

This involves checking the trained model to ensure that it delivers the target on new and future/unseen data. This also ensures that the trained model generalizes using test data set which can be a subset of your training data or must have the same schema as the data which was used for training.

The test data set should have the expected results to enable a comparison between the results of the trained model and the test dataset.

3. Model Improvement:

Results of the evaluation is used to make necessary adjustments to the model. This is done iteratively.

AI Operationalization

The operationalization phase, therefore, happens using live data in the “real world” i.e. in the production environment (not training or test environment).

1. Model Deployment:

The output of the AI trained model will be scored against live data in the production environment, hence, the deployment of this model should consider the entire data pipeline which constitutes the following:

- **Infrastructure:**

Organizations must ensure they build infrastructure that is scalable for the business. It is important to consider the intense computing power requirements of the production environment and the heaps of data to be processed. Such infrastructure should be able to handle different sources of data i.e. unstructured and structured data and process these different data sets.

- **Data Management:**

Organizations also need to consider an automated means of cleansing, transforming and labelling real-time data before feeding it into the ML models for evaluation, this could also be an additional logic that needs to be inputted into the AI model to handle these bad data inputs while avoiding bad predictive outputs.

- **Deployment Platform:**

It is also important to consider which platform the model will be deployed. Depending on the use case of the model, it could be deployed on web apps, mobile apps such as android apps, cloud-based services such as AWS, Azure, Google Cloud Platform etc. Other ways to deploy the model include converting the model into an API using Django or flask.

2. Monitoring Model Performance:

Ongoing monitoring and periodic review of deployed models ensures that the model performance is within agreed parameters and enables identifications of model limitations and weaknesses. This periodic review process should incorporate information that has become available since the model was developed, which allows validators to affirm the model’s ability to continue to meet the model objectives.

During this monitoring phase, metrics (that should estimate success for the model) will be collated and analyzed to validate the model’s performance in comparison with expected output/agreed parameters. The risk associated with the model can be therefore assessed and effectively managed by allowing rapid, real-time drill down into the model to analyze latency, throughput, error rates etc. The output of the analysis will form a basis for a retraining of the model if performance is not within the expected range/agreed parameters.

3. Model Retraining:

Results of the metric analysis or monitoring are used to make necessary adjustments to the model. Sometimes developed models could have performance degradation arising from a large increase in the variance between the training data and the real-world data being fed to the model in production. At this point, it is important that fine-tuning of the model using new training data is performed to optimize the output of the AI model. The new training data can be explored and examined to unveil the biases, unknown weaknesses, possible strengths and opportunities to get the best of the AI model. New algorithms, models and tools can then be built to solve problems and automate work.

They should also ensure the maintenance of the accuracy of these AI models over their life-cycles.

Even with relatively small data sets, we’re seeing a 10-20 percent uplift in the predictive power of some credit risk models when we apply advanced analytics techniques. This gets slightly reduced in production as we have to overlay the models with some additional constraints. Once we actually operationalize this we’ll have

1. Better fraud detection

2. Better ability to extend credit to people where traditional models would say no.

Scaling this out across our portfolio will take some time but it will mean better lending decisions, better customer service and therefore better products.

- Cloud and Big Data Lead, Top Tier Bank

We have seen a few AI tech players in Africa

As earlier mentioned, we have seen AI help improve business processes due to its ability to analyze and learn from huge data, whether structured or unstructured. As a result, the use cases of AI span various industries, some of which have been earlier highlighted. The current AI tech players and associated uses cases of this technology, especially in Africa, are highlighted below amongst others.

1. Credit

Kenya Product "Fuliza"

The product was conceptualized based on data collected and analysed from M-Pesa customers. The former CEO, Bob Collymore, said we saw that on a daily basis, over half of them were not able to complete transactions because the customers didn't have enough money in their accounts. But we know that these people are not poor – that they have the money. This is because the data shows that two days later, these transactions were usually completed. The overdraft product was released to the Market in January 2019 and targeted to operators of M-Pesa accounts. Safaricom boasts of an aggregate of Sh140 billion (i.e. more than USD1 billion) from the overdraft service in its first nine (9) months of operations. Arguably the biggest on the Africa Continent, Fuliza, the mobile overdraft facility, allows customers to complete their financial transactions when they have insufficient funds in their account. The partnership involves KCB Group, Safaricom, and Commercial Bank of Africa (CBA) with a revenue share ratio of 20 per cent, 40 per cent and 40 per cent respectively.

Nigerian Company "Mines"

Fintech is one of the financial sub-sectors in which AI is making waves. Specifically, "Mines" in Nigeria operate as a Credit-as-a-service digital platform to provide digital credit products for customers. Mines has an integrated platform and a leading lending solution that leverages Machine Learning algorithms to analyze customer phone records, bank records, and payment transactions to assess credit risk, along with full automation to manage the credit application and delivery process. Mines has been used by over one million customers in Nigeria since it began operation in the country.

2. Fraud Reduction

Ugandan Company "Awamo"

Awamo in Uganda uses AI to reduce fraud when signing up customers and businesses to their platform. The platform operates as a digital banking platform and credit bureau which helps to digitize business procedures, credit information sharing, and many other services using mobile devices.

3. Increased Sales and Revenue

South African Company "DataProphet"

DataProphet uses AI within the manufacturing sector to improve the efficiency of the manufacturing process by optimizing process parameters. Using advanced predictive and prescriptive machine learning capabilities, it can predict defects, faults and quality errors and prescribes the ideal process variables to shift processes to higher yields. Specifically, it works with customers such as car manufacturers like Mercedes-Benz and BMW, helping them generate a dynamic process control plan for engineers to eliminate defects & scrap (achieve zero defects) and improve yield while reducing downtime.

South African Company "Aerobotics"

Aerobotics uses machine learning to analyze maps and extract actionable information for crops to enable early detection of pests and diseases. This is guided by drone and satellite imagery. The company's agronomists have labelled and classified hundreds of thousands of data showing various kinds of pests and diseases. This information has been fed into their machine learning algorithms, enabling them to learn what pest and disease symptoms look like, just as a person would. This is used for farm consultation services as it aids early detection. There are currently 500 farmers in 11 countries using technology.

4. Improved Customer Experience

Nigerian Chatbot "Ivy"

Chatbots have been in the market for several years, but the newer ones have a better understanding of language and are more interactive. Specifically, Ivy uses text messaging through an automated chatbot to improve the customer experience of money transfers, bill payments with reminders, data subscriptions and buying airtime.

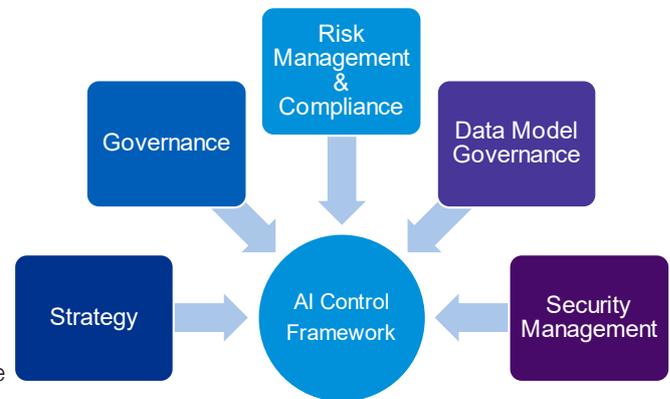
South African "Finchatbot"

This AI-powered chatbot monitors industry trends to increase sales conversion rates, predict customer needs and suggest business solutions. This is also used to help financial service providers acquire and retain customers through AI-powered conversations. Other companies use chatbots for personalized shopping that involves understanding what you and people like you bought, in addition to what you are searching for.

Mitigating the Risks of AI utilization

Just how dangerous can AI be ?

Artificial intelligence has the potential to tremendously impact lives and businesses. However, like many promising new technologies, it is not without its potential pitfalls. The risks of utilizing AI technologies will continue to rise as the complexity and ubiquity of its applications increase. The security risks of AI revolve around a few key risk areas, most notably privacy, regulatory compliance and most importantly, alignment with utilization objectives. Artificial intelligence at its core is driven by a variety of mathematical models, while recent advances in technology have made them remarkably accurate, they are still susceptible to errors. The impact of these errors depends on the criticality of the task performed by the AI. The privacy concerns associated with AI stem from its consumption of massive amounts of data via a variety of channels (i.e. images, voice recordings, health records, etc.) in order to train and optimize the algorithms powering it. The unintentional consumption of personal data via the method results in significant breaches of privacy.



How businesses can utilize AI safely

To safely utilize artificial intelligence, organizations need to establish control frameworks which guide the implementation, utilization and evaluation of AI. AI control frameworks must address key areas such as governance, strategy, risk management, business continuity and change management among others.

AI in the Cloud

A beneficial collaboration

The emergence of cloud computing technologies has been a game changer for several industries and businesses by providing additional efficiency, flexibility, security and speed. Cloud computing is a term used to collectively refer to variety of services employed in order to store, manage, and process data over the internet as opposed to doing so locally. It usually takes the form of infrastructure, software or a combination of both utilized remotely in order to perform a variety of services, among these is an emerging service termed AI as a service (AIAAS). AIAAS features capabilities such as automated recommendation systems, language processing and image analysis among others with performance enhanced by the tremendous storage and processing capabilities offered by cloud computing service providers. Leading cloud services providers such as Microsoft's Azure, Amazon web services and Google's compute platform offer a variety of readily available AI services on the cloud to support the growing adoption of the technology⁶.



What we see

Walmart employs the HANA cloud platform by SAP in combination with machine learning algorithms in order to identify irregularities in its business operations and make better informed data driven decisions in the process of resolving them⁷.

What the Future holds

The continuous integration of AI technology with cloud computing has led to the creation of enterprise based software which boasts of both capabilities and are expected to have a significant market penetration among companies seeking to employ such technologies by 2020.

⁶<https://www.forbes.com/sites/moorinsights/2019/02/07/ai-cloud-or-on-prem>

⁷<https://emerj.com/ai-sector-overviews/ai-in-business-intelligence-applications>

Key Contacts

Bisi Lamikanra

Partner & Head

Advisory Services
KPMG in Nigeria
M: +234 803 402 0982
E: bisi.lamikanra@ng.kpmg.com

Joseph Tegbe

Partner & Head

Technology Advisory & Markets
KPMG in Nigeria
M: +234 803 402 0989
E: joseph.tegbe@ng.kpmg.com

Gerald Kasimu

Partner & Head

Advisory Services
KPMG in East Africa
M: +25420 280 6000
E: gkasimu@kpmg.co.ke

Boye Ademola

Partner & Lead

Digital Transformation
KPMG in Africa
M: +234 803 402 0983
E: boye.ademola@ng.kpmg.com

Andrew Akoto

Partner & Head

Risk Consulting
KPMG in Ghana
M: +233 20 817 4629
E: aakoto@kpmg.com

Ladi Asuni

Partner

Digital Transformation
KPMG in Nigeria
M: +234 803 975 4101
E: ladi.asuni@ng.kpmg.com

Tunji Odumuboni

Associate Director

Digital Transformation
KPMG in Nigeria
M: +234 803 720 6478
E: olatunji.odumuboni@ng.kpmg.com

Yomi Akinyemi

Associate Director

Data & Analytics
KPMG in Nigeria
T: +234 803 975 4097
E: oluyomi.akinyemi@ng.kpmg.com

Femi Olofinlua

Manager

Digital Transformation
KPMG in Nigeria
M: +234 706 417 1666
E: olufemi.olofinlua@ng.kpmg.com

Egheosa Onaiwu

Associate Director

Clients & Markets
KPMG in Nigeria
T: +234 803 535 3099
E: egheosa.onaiwu@ng.kpmg.com

David Okwara

Assistant Manager

Markets
KPMG in Nigeria
M: +234 708 383 3853
E: david.okwara@ng.kpmg.com

home.kpmg/ng

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