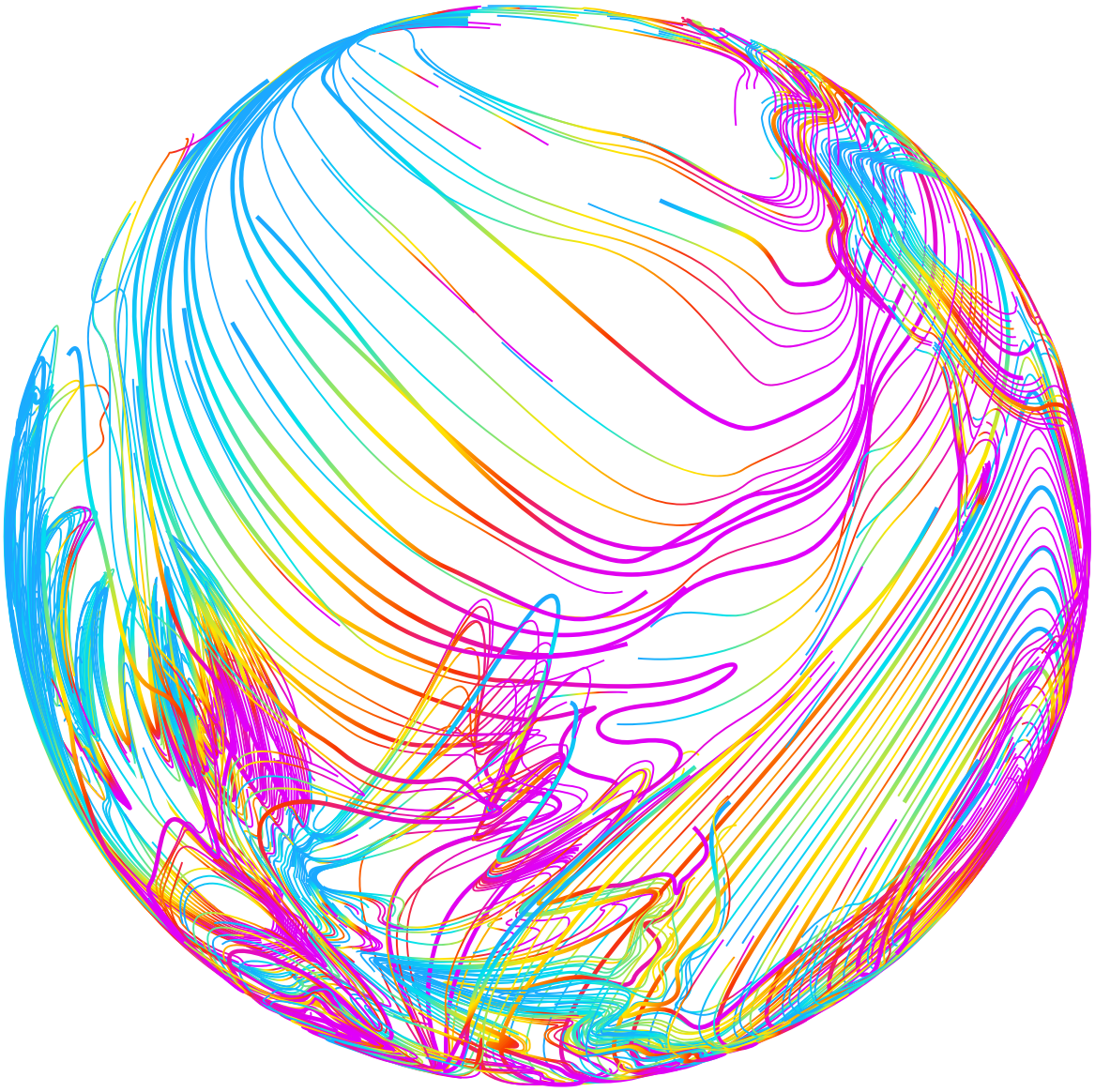
Deloitte.
Digital



From mystery to mastery:
Unlocking the business value of Artificial Intelligence in the insurance industry

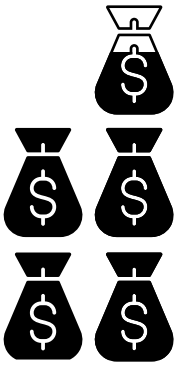
1. Introduction

On January 25th, 2017, sixty-eight years after it was published, George Orwell's book Nineteen Eighty-Four became the number one best-selling book on Amazon. With its eerily accurate predictions about advanced technology becoming an integral part of everyday life, the book's revived popularity only hints at the massive surge of excitement surrounding one specific subject: Artificial Intelligence (AI). The numbers tell the same story: deals to AI startups enabling computers to mimic human intelligence and decision behavior increased 4.6x, from 150 in 2012 to 698 in 2016[1]. With a combined funding of USD 4.8B in 2016[2] and a projected overall spend of USD 47B by 2020[3], a world in which AI is prevalent is no longer mere fiction.

However, not all the book's predictions have come true. Nineteen Eighty-Four painted a futuristic picture of a totalitarian Big Brother regime that controls every breath of its inhabitants, but a look at the world today reveals the fundamentally positive impact of AI on organizations, entire industries, and life itself. Tech giant Google, for instance, has cut its data center energy usage by 15% by applying its DeepMind AI technology to predict the incoming computational load and adjusting its power consumption patterns[4]. In the financial industry, the world's largest asset manager, BlackRock Inc., is now entrusting more of its USD 5.1T in assets to robot stock pickers to decide what to buy and sell instead of human portfolio managers. And car manufacturer Tesla has achieved a 40% drop in road accidents with a new AI feature deployed in its cars, compared to models without the feature[5]. Apart from organizations, our own homes are also getting more intelligent. In 2017, 35.6M people in the US will have used a voice-activated assistant device at least once a month. That's a jump of almost 130% over 2016[6]. And we expect numbers in Europe and Asia to follow this trend as well.

With more than 85% of customer interactions predicted to be managed without a human by 2020[7], the evident business value of AI is attracting the attention of CEOs and top managers regardless of industry. That said, while almost all industries have already seen major success with AI or have started investing, some are lagging behind. With only 1.33% of insurance companies investing in AI compared to 32% in software and internet technologies, the insurance industry is still lagging behind the world's AI movement[8]. Executives in insurance, however, are experiencing a particular sense of urgency to act: in few other industries is AI's underlying sustenance – data – as abundant and important as in the insurance industry – making the mastery of this area of technology a key competitive differentiator for insurers moving forward into the digital future.

But how can executives guide their organizations to reap the benefits from AI and exploit the benefits that beckon? To enable businesses to move from mystery to mastery, this paper presents a set of tools and frameworks that provide key insights into the fundamentals of AI technology, including the inner workings of Machine Learning. We will cover the art and science of defining concrete AI use cases and the models of AI value creation to deliver top- and bottom-line impact. Moreover, we aim to give an insight into the current status of and future outlook for AI use cases that will impact the 300-year-old insurance industry as it rapidly approaches disruptive transformation.



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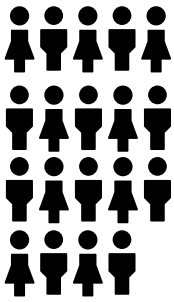


35.6M
people in the US will have a voice-activated assistant in 2017

1.33%
of insurance companies invest in AI in 2016

With a combined funding of USD 4.8B in 2016, a world in which AI is prevalent is no longer mere fiction.

2. AI is the enabler for disruption

2.1 The future is now – technology-enabled innovation in insurance

Deterioration of traditional profit pools, changing competitor landscapes, technological innovations and changing customer expectations are calling for a new perspective on insurance. However, traditional insurance players are often slow to react to the new demands and possibilities of the digital era. This opens up the playing field to InsurTech startups and Tech incumbents who capitalize on new business models and improved customer experiences. The new players promise and deliver faster claim payments, greater price transparency and on-demand policies, while decreasing the cost and the resources required (Figure 1). Global VC funding of these new businesses totaled USD 1.7B across 173 deals in 2016 as compared to USD 0.14B among 28 deals in 2011 – clearly increasing the seriousness of competition for traditional insurance players (Figure 1).[9]

At the heart of the rise of these new players is the improvement in existing digital technologies and the emergence of new ones. These technologies enable practitioners to rethink the 300-year-old insurance industry at every level, from business model to value chain and from customer interaction to automation. In reshaping the industry's data-hungry and mostly standardized processes as well as the resource-intensive handling of their customer relationships, one technology stands out as particularly promising for insurers: Artificial Intelligence. Ninety-five percent of insurance executives intend to start or continue investing in AI capabilities in the future[10], while investments in AI have already increased by 69% between 2011 and 2014, totaling a staggering USD 5B in 2014.[11]

Ninety-eight percent of insurance executives believe that cognitive computing will play a disruptive role in the insurance industry.

Figure 1: Value proposition and Venture Capital funding of selected InsurTech startups

Clover

Funding: USD 285M
HQ: San Francisco, CA, USA

A health insurance startup that leverages AI by using data and software to build clinical profiles of people, and identify gaps in care. These gaps in care are filled with visits and a free choice of doctor to avoid costly hospital stays.

Fabric

Funding: USD 2.5M
HQ: Brooklyn, NY, USA

A life insurance startup that uses AI to generate quotes for accidental death claims. Simplified processes enable a life insurance sign-up process in just two minutes. The browser-based product is available on tablet, notebook, and mobile.

GetSafe

Funding: Undisclosed
HQ: Heidelberg, Germany

An InsurTech startup that takes advantage of AI by advising customers on which insurance policies to purchase and by collecting relevant information. GetSafe also provides customers with an app to manage all their insurance policies in one place.

Trov

Funding: USD 87M
HQ: San Francisco, CA, USA

An on-demand property insurance startup in which an AI chatbot handles claims. Insurance can be started immediately via an app to cover damage, loss, and theft. Like dating apps, customers can swipe insurance on their valuables on or off.

Lemonade

Funding: USD 60M
HQ: New York, NY, USA

A property and casualty peer to peer insurance that uses AI-powered claims analysis. Eighteen anti-fraud algorithms are run on image and video claims information from the customer and a response is given to within minutes.
At Lemonade, small insurance groups pay a fixed fee into a claims pool. Surpluses from the claims pool go to chosen common causes or back to the peers.

2.2 Data is the new currency – the importance of AI to win in a "datafied" world

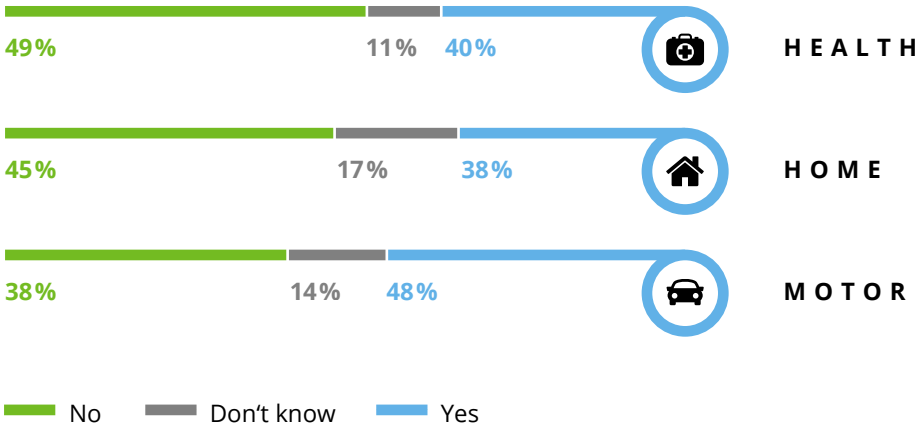
One key reason why AI will prove to be crucial is the ever-increasing "datafication" of business interactions, private life, and public life. In the age of digitalization, more and more data is being collected – by organizations, governments, households, and individuals. Already today, 2.5M terabytes of data are created every day.[13] That quantity is due to increase exponentially on account of new sources like sensors on property and machines, connected devices, mobile devices, and digitalization of processes, together with customers' increasing willingness to share personal information – provided they receive a benefit in return (Figure 2).[14]

An "arms race" has begun as to who can gather the most data in an effort to achieve a competitive advantage. However, the data must be meaningfully processed to access its value, as illustrated by the following quote of a Chief Underwriting Officer (EMEA): "We have a lot of data but the question remains what to do with it."[15]

The success of using data to one's advantage therefore depends on the appropriate tools to process it – and this is where AI comes in. By intelligently and independently sifting through huge amounts of data with powerful algorithms, AI goes beyond "just" data analytics in generating novel insights and automating repetitive tasks. AI thereby offers great opportunities for optimizing existing and enabling new procedures, giving a competitive edge to businesses today and in the future.

However, understanding how AI and more specifically Machine Learning turns data into knowledge and action and how this relates to hyped topics, such as chatbots or robo-advisors, can be challenging. To be able to leverage AI effectively, organizations need to combine a technological view with a business view – in other words, an understanding of what is technologically feasible today with an understanding of how AI can create value for an organization.

Figure 2: Proportion of customers who would be willing to track their behavior and share this data with insurers for a more accurate premium



3.
AI technology is poised to make a difference

3.1 Don't believe the sci-fi movies – where AI stands today

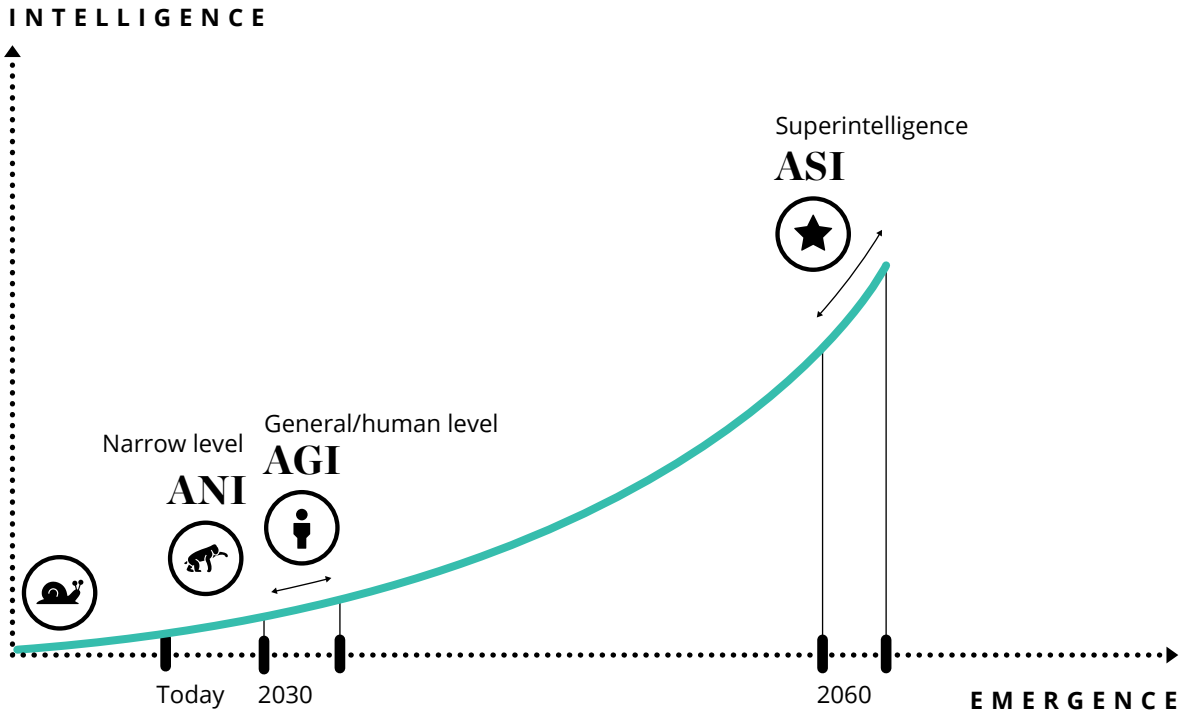
Recent quotes like the one by Stephen Hawking below are often used as eye-catchers, but tend to portray a negative picture of an almighty AI. Despite the speed of AI developments today, the current status of the field by no means resembles a villainous, free-willed AI as portrayed in science fiction movies. Instead, AI has slowly but steadily begun to affect our lives by facilitating many of our everyday tasks and activities, from scheduling meetings, to selecting movies, to driving cars.

The type of AI often feared in the media is referred to as **Artificial Superintelligence (ASI)** – an omnipotent AI that significantly outperforms its human counterparts in any area or task. In contrast, an AI matching humans' capabilities and ways of thinking is referred to as **Artificial General Intelligence (AGI)**. However, both ASI and AGI are still a long way from today's reality.

STEPHEN HAWKING

The rise of powerful AI will be either the best or the worst thing ever to happen to humanity. We do not know which.

Figure 3: How smart is Artificial Intelligence?[17]



The state of AI feasible today is referred to as **Artificial Narrow Intelligence (ANI)** (Figure 3). ANI has seen a recent boom in applications – enabled predominantly by exponential increases in available processing power paired with advances in gathering, storing, and transferring data. However, each ANI is still only able to complete very narrow, clearly defined tasks within one application area and unable to build on its capabilities to learn tasks outside this application area. In a specific task, however, an ANI can become as good as or better than any human – as illustrated by Google's ANI that beat the human champion of the Chinese board game Go. Yet, the same ANI would be unable to learn how to play chess, even though chess is significantly less complex than the game of Go.[16]

Underlying the applications of ANI are a multitude of instruments rooted in data science – the most important one being Machine Learning (ML). In contrast to traditional programming and data science, an ML algorithm learns the transformation rules to create a desired output based on a given input by itself (Figure 4).

Figure 4: Difference between traditional programming and machine learning

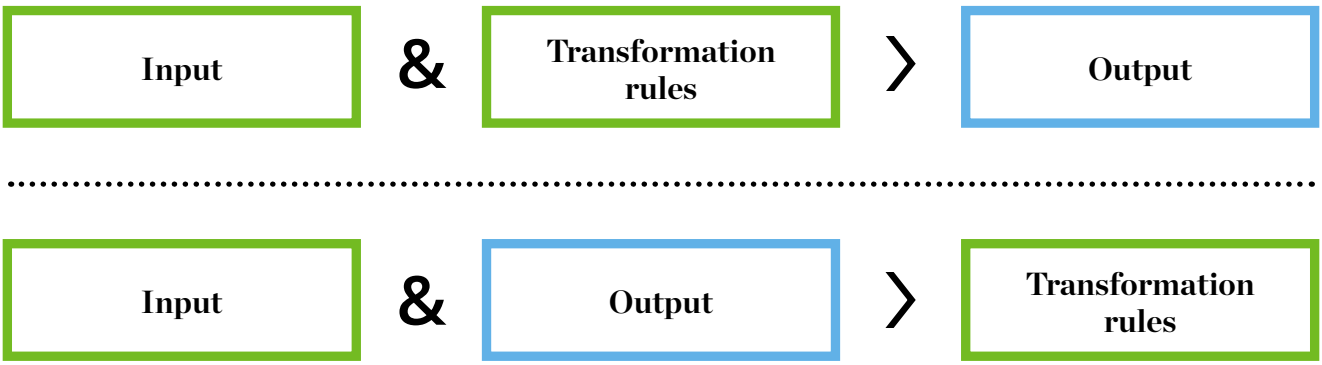


Figure 5: Machine learning training types[18+19]

Supervised Learning

is a method of training an algorithm on labeled data, meaning that parts of a document are "tagged". For example, in a contract, items like the contract parties' street, postal code, etc. may be tagged to enable the algorithm to identify addresses in contracts by knowing which elements constitute an address and where to look for them. Supervised learning is the most common method for training ML algorithms today.

Unsupervised Learning

is a method of training an algorithm on unlabeled data, meaning the algorithm identifies concepts and derives conclusions entirely on its own. For example, in the Google Brain project an algorithm learned to detect faces and cats in videos by clustering common structures (without knowing the definition of a cat or face prior to analysis).

Reinforcement Learning

is a method of training an algorithm on unlabeled data where the output is rated by the researcher as either correct or incorrect. Over time, the algorithm can produce the correct output based on learning from reinforcement of correct answers and punishment for incorrect ones. For example, an algorithm learned to play Super Mario by reinforcement, being punished for "dying" in the game and reinforced for "surviving" and collecting points.

The ML algorithm learns the transformation rules by iteratively reducing the deviation between the created and the desired output – a process referred to as training. While different forms of training exist, today's most prominent form of training is the so-called supervised learning – a method requiring large amounts of labeled data to train the algorithm (Figure 5).

Facebook's facial recognition for example, an image recognition ML algorithm[20] independently learned how to identify and detect human faces. This nine-layer neural network was trained with four million images of faces of 4,000 individuals, meaning the algorithm was exposed to 1,000 different pictures of each person in order to enable the algorithm to be able to reliably identify the specific person among others.

A human would require no more than a handful of pictures to learn the same skill. However, unlike humans, ML is unable to make abstractions and inferences from only a few data points. Over time, as the amount of data processed by the algorithm increases, predictions become more accurate. Facebook's "Deep Face" can identify a specific face with 97% accuracy, which equals human ability.

3.2 Machine Learning is not the full picture – understanding AI applications

Typically, an AI can either be trained from scratch using a Machine Learning framework, such as Google's TensorFlow or Apache Spark's MLlib, or be bought as a pre-trained model. These pre-trained models are typically specialized in a certain area such as voice or image and video recognition, text analytics, biometrics, sentiment detection or decision management (Figure 6).

For example, Amazon's Alexa is already trained to understand several languages. Companies can build certain "Alexa skills" that are then integrated in the Alexa app, Amazon Echo, or a wearable such as headphones. It will soon be possible to integrate Alexa into any external app or website to enhance it with a natural language layer. Capital One has built a skill for Alexa, which can be activated in the Alexa app, to enable transactions and account balance checks using voice commands. A customer can ask Alexa about their account balance (speech input); Alexa then analyzes the intent of the question, connects to the customer's Capital One account (database) to retrieve the account balance, and presents the answer in spoken natural language to the customer (speech output) (Figure 7). An AI application includes not just the underlying ML algorithm but also retrieving relevant information from a database and presenting it through an interface to the user.

Figure 6: Exemplary list of pre-trained AI models

1. Speech/voice recognition

Understand and interpret the spoken word. For example, Pop Up Archive automatically tags, indexes and transcribes audio files with speaker detection.

2. Sentiment detection

Detect and analyze emotions in the written or spoken word. For example, Beyond Verbal extracts emotions from raw voice clips in real time.

3. Recommendation engine

Interpret results and recommend appropriate actions. For example, Zendrive uses sensor data on smartphones to analyze driving behavior and re-commend behavior changes.

4. Text analytics and NLP

Understand and interpret written text and whole documents. For example, x.ai's personal assistant Amy "reads" emails to find scheduling related information to book meetings in the user's calendar.

5. Pattern/ anomaly detection

Detect patterns and anomalies to derive conclusions. For example, Cyence models cyber risk based on human and machine data cluster analysis.

6. Automatic decision management

Derive and automatically apply rules and logic in AI systems. For example, Boomtrain enables automatic, personalized marketing by targeting only specific customers.

4. Natural Language Generation (NLG)

Generate and deliver information in natural language. For example, Narrative Science offers easy-to-understand reports in natural language based on company data.

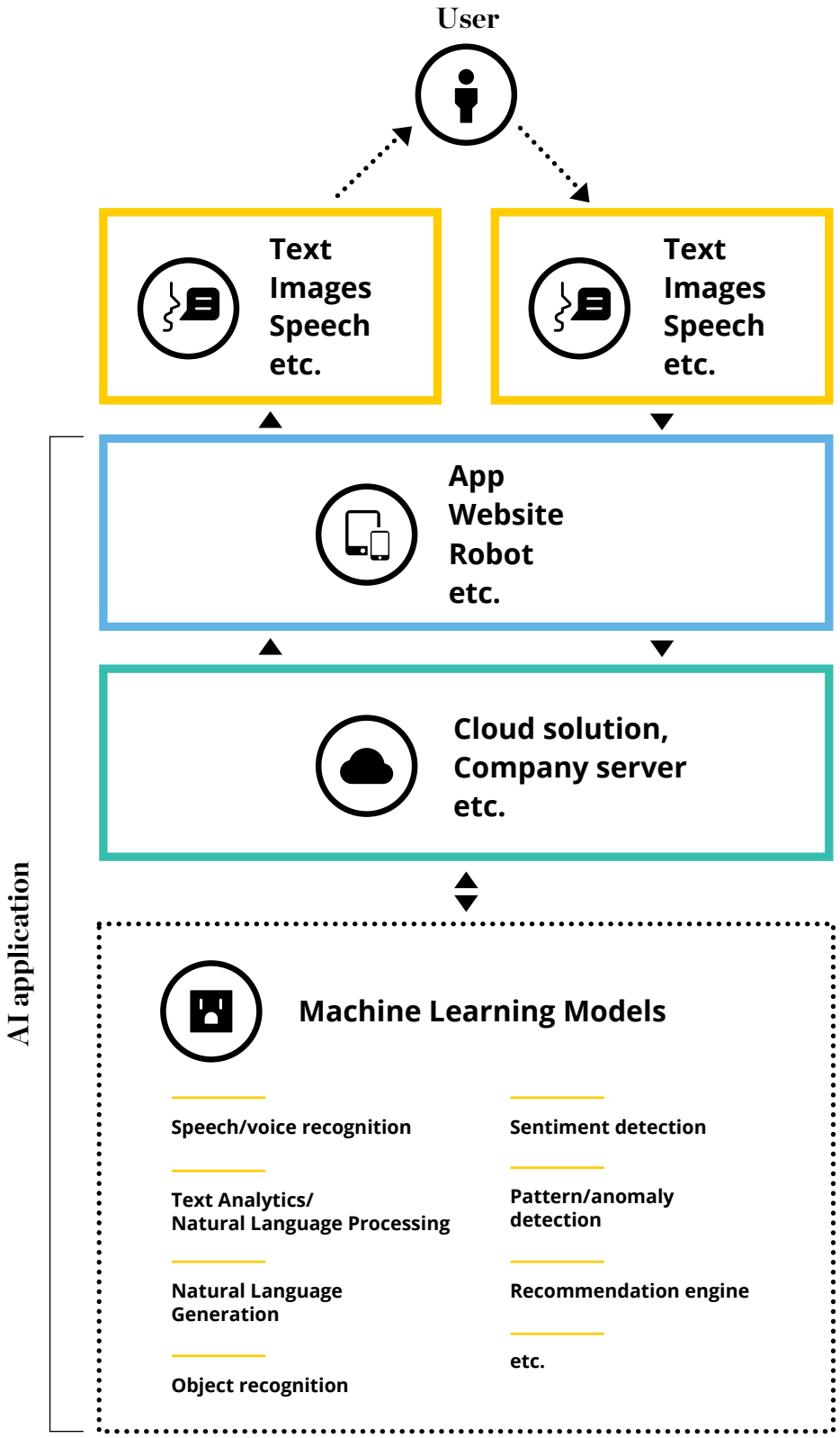
5. Object detection

Interpret and analyze objects shown on images or in video. For example, Nauto uses video analysis to offer guidance and insights to drivers in real time.

6. Biometrics

Uniquely identify a person or measure and interpret human physical states (such as emotion or intent) from biological characteristics, such as facial structures or heart rate. For example, Bionym enables authentication through cardiac rhythm measured by a wristband.

Figure 7: Simplified demonstration of communication transfer between AI and users




$F = G\frac{m_1 m_2}{r^2}$
$E_k = \frac{1}{2}mv$
$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$
$a^2 + b^2 = c$
$\int_{-1}^{1} \frac{dx}{\sqrt{1-x^2}}$
$\mathbf{F} = m\frac{d\mathbf{v}}{dt} = m\mathbf{a}$
$\mathbf{E} \cdot d\mathbf{S} = \frac{1}{\varepsilon_0} \iiint_\Omega \rho \, dV$
$\sin^2(\theta) + \cos^2(\theta)$

4.
Apply our Use Case Formula to leverage AI in your business

4.1 Know what you want – the importance of defining a specific use case

The wide array of possible AI applications is appealing for businesses, yet the extremely narrow nature of today's AI applications is severely complicating the identification of a relevant starting point. As a result, almost 40% of practitioners who have not yet invested in AI don't know what AI can be used for in their business.[22] In order to exploit relevant opportunities, businesses must face the challenge of identifying concrete use cases for AI. In contrast to the purely technological view on AI applications, which focuses on the ML model and interface (see Figure 7), an AI use case describes the underlying technology and observable functionality from the perspective of the user and the resulting value. A use case hence represents the business view of an AI application.

Almost 40% of practitioners who have not yet invested in AI don't know what AI can be used for in their business.

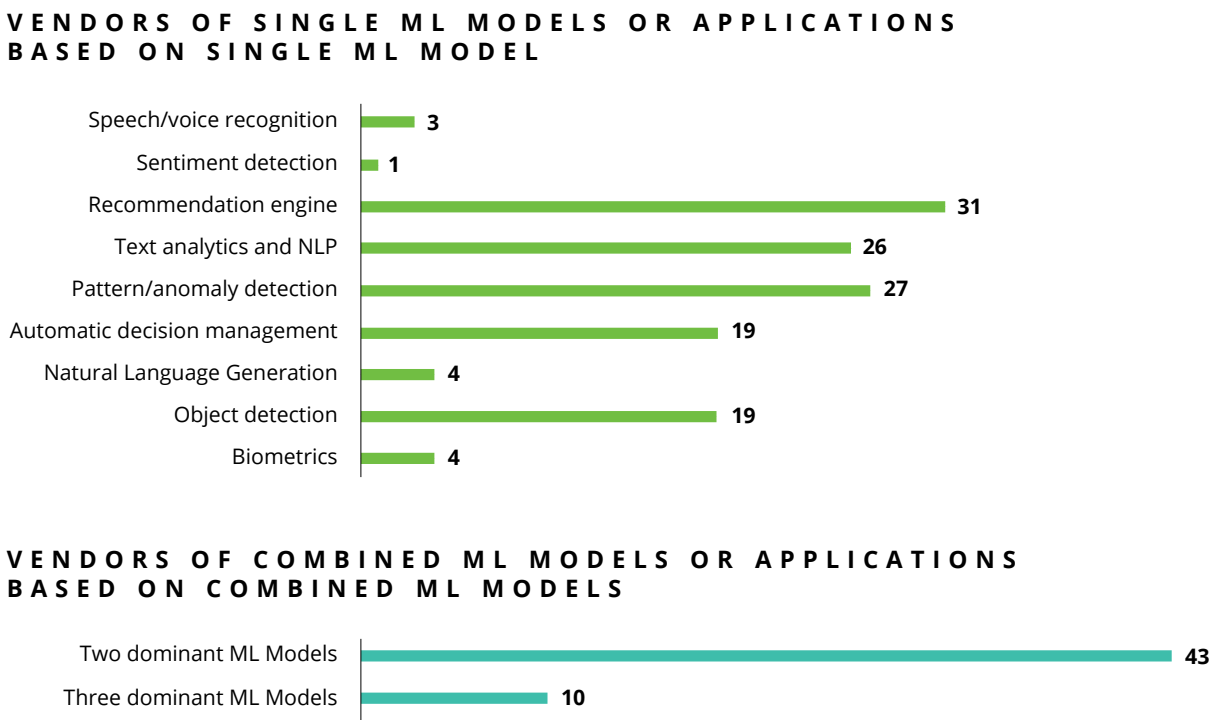
4.2 Apply the magic Formula – the three dimensions of a Use Case Formula

We reviewed publicly available information on nearly 200 AI vendors of ML models and AI applications and categorized them according to their predominantly deployed ML models (Figure 8). By determining the fundamental characteristics that differentiate one use case from another, we have identified three distinctive dimensions. These dimensions encompass the **functionality, input data** and addressed **customer need** of an AI application.

Using these three dimensions, a use case can be described based on our Use Case Formula: Do x (functionality) based on y (data) in order to address z (need). Figure 9 describes the formula with the content of each part in detail.

First and foremost, a use case must serve a **functionality**. The spectrum of possible functionalities includes an informing, recommending or deciding AI solution in a business process. Within each of these categories, many applications are already feasible today, but even more will emerge as AI technology continues to develop.

Figure 8: Dataset of 187 leading AI vendors categorized according to predominantly deployed ML models



In performing any of these functionalities, the AI application can either serve an internal customer, such as an employee, or an external customer, such as an end user. For example, the KLM chatbot on Facebook Messenger informs external customers about their flight status or issues their boarding pass. In contrast, KIA uses sentiment analysis of customer feedback on social media sites to inform internal marketing employees of the success or failure of an advertising campaign.

The second ingredient necessary to define a use case is **data**. Without high quantity and quality of data, it is impossible to get an AI application up and running. In fact, for modern data-hungry ML models, performance is more dependent on the quantity and quality of the data than the algorithm doing the learning, partially because many ML models are available as open source, such as Google's TensorFlow or the popular Scikit-learn.

There are four data types that can act as input for a ML model: company data, such as call logs or manuals; public data, such as Wikipedia or other open source content free to use without permission; third-party data, such as Facebook user profiles, which can't be used without permission; and lastly customer data, such as data gathered through sensors at home or in a car.

Depending on the data type used, time and effort must go into preparing and cleaning appropriate training sets. AI applications are not limited to run on structured data but can also process unstructured data, which accounts for about 80% of today's data.[24] For example, Facebook leverages a combination of structured user profile data and unstructured public data, including e.g., news sources, to help eliminate fake news.[25]

In order to derive tangible business value from a use case, a third ingredient must be included in the Formula: **customer and organizational needs.** A use case must always address and resolve a user need in order to create value.

Organizational needs can include becoming more efficient or keeping knowledge within the company. (External) customer needs refer to, for example, more personalized communication with customer service agents or receiving an affordable product price.

To define concrete use cases for AI, all three ingredients need to be combined into the Use Case Formula, thereby organizing all crucial characteristics and information about a use case in a relevant structure. The categories of possible "input values" provided for each ingredient of the Formula outline the comprehensive playing field for AI applications, whereas the examples given in each category may need to be extended and adjusted to a specific industry. Practitioners can analyze existing case studies or brainstorm novel use cases by referring to the Use Case Formula's three dimensions and possible "input values" in each dimension.

For analysis purposes, the Use Case Formula can be applied to abstract an underlying AI use case from e.g., a media report about a business successfully leveraging AI by synthesizing the most relevant information into a pointed use case definition.

For ideation purposes, practitioners can play through different meaningful combinations of the "input values", keeping in mind that not all combinations are feasible or valuable today and interdisciplinary expert advice should be sought in the process.

Once a valuable use case is identified, it can be effectively communicated using the Use Case Formula.

PETER NORVIG | RESEARCH DIRECTOR AT GOOGLE

We don't have better algorithms, we just have more data.

Figure 9: The Use Case Formula and its three dimensions

“Do x (functionality) based on y (data)

For example, Spotify recommends new artists and songs (functionality) based on previously played genres/artists (data) in order to make relevant content easily and quickly accessible to users (need).

Functionality

Inform

Provide insights based on one or a combination of several data sources (manuals, sales data, etc.)

Common informing applications are e.g., cluster customer segments, evaluate customer behavior, predict disease outbreak, etc.

Recommend

Advice on appropriate actions based on insights generated from processed data sources (user behavior, public historic data, etc.)

Common recommending applications are e.g., suggest new products to customers, prescribe medical treatment plans for patients, guide customers through the product selection process, etc.

Decide

Perform actions based on derived implications from processed data sources (user behavior, customer emails, voice commands, etc.)

Common deciding applications are e.g., adjust prices in real time, send emails to customers, schedule meetings, transfer money, etc.

Input data

Company

Product literature

Manuals/specifications

Guidelines

Procedures/policies

Journals

Best practices

FAQs

Certification tests

Brochures

Call logs

Images

Client profiles

Usage data

Sensor data

etc.

Public

Wikipedia

Industry definitions

Open source content

Regulatory guidelines

Images

Type systems

etc.

in order to address z (need)."

Customer and organizational needs

Third-party

Subject matter domain content

News feeds

Market data

Business reports

Industry intelligence

Risk analysis assessments

Industry definitions

Images

Taxonomy/ontology

Market data

etc.

Customer

Feedback data

Smart home data

Driving behavior

Fitness/health records

Sensor data

etc.

Product

Offering

Adequate to fulfill needs of customers

Personalized to individual customers

Available at any given time

etc.

Cost

Affordable product price

Transparent cost structure

etc.

Convenience

Intuitive interface and use of product

Flexible use rates of product

Private use of data

Fast product delivery

etc.

Communication

Channel

Reachable through any channel

Continuous interaction across channels

etc.

Touchpoints

Trustworthy customer service

Helpful problem-solving and solution recommendations

Personal service and conversations

Timely responses and help

etc.

Operations

Processes

Efficient use of time and money

Accurate processes without mistakes

Engaging tasks for employee

etc.

Resources

Effective resolving of problems and fulfilling tasks

Knowledgeable employees

etc.

5.
AI creates tangible business value in four distinct ways

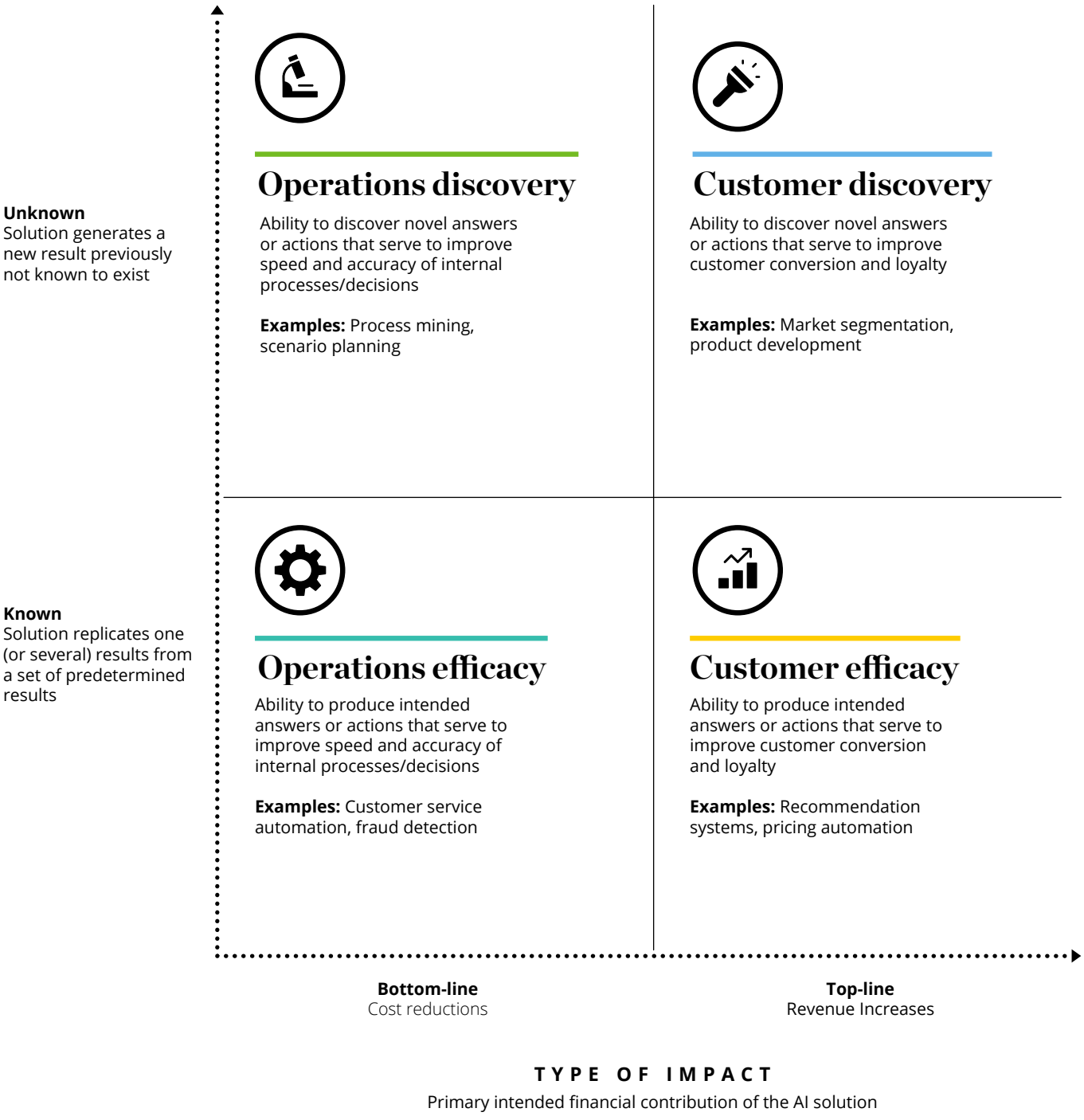
5.1 Know where to start – four models of value creation for AI

The Use Case Formula provides the required generic structure for defining and describing AI use cases. However, it does not specify where to begin looking for use cases or the context in which to place a use case. Having reviewed close to 200 vendors and their clients, we found that a comprehensive overview of the AI value landscape in a business context can be achieved by mapping AI use cases in a 2x2 matrix according to their type of result and type of impact. This overview clusters use cases based on the type of value created and can serve to define a starting point and context (Figure 10) for AI use cases.

ANDREW NG | FOUNDER OF GOOGLE BRAIN

Even though a lot of the buzz in AI has been around large tech companies, if you look across an entire economy, really any Fortune 500 company can create a lot of value with AI as well.

Figure 10: The AI value map – four areas of value creation



Efficacy = ability to produce a desired or intended result
Top-line = measure of revenue or gross sales
Bottom-line = measure of net income

The **type of result** axis distinguishes whether an AI application produces unknown or known results. The replication of known results matches input with a predetermined set of answers or actions, e.g., a chatbot tries to understand the intent of the customer and retrieves the most appropriate of a set of existing answers from a database. On the other hand, the generation of previously unknown results creates new insights and answers. These generative algorithms are capable of things such as identifying new criteria based on which they can more effectively segment customer groups or design completely new products based on only a few given parameters.

The **type of impact** axis distinguishes whether an AI application delivers financial impact on the top or bottom line. Bottom-line improvements are achieved through reduced costs, e.g., reduced need for highly qualified staff or quality and reliability improvements. Top-line improvements are realized through increases in revenue, such as reduced customer churn or improved customer lifetime value. Combining the two dimensions, four areas for value creation with AI emerge.

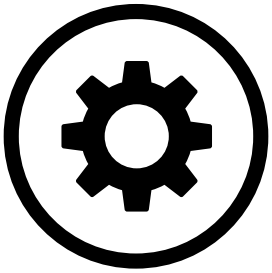
Notably, many real-world use cases can create value in more than one of the four value areas – particularly if they evolve over time. The categorization into the four areas, however, helps to define a clear starting point as well as to sharpen the focus for the primary intent of an AI application.

JUERGEN MUELLER | CIO OF SAP

Recruiters spend 60% of their time reading CVs. Why should a person read 300 resumes if a machine can propose the top 10?

5.2 Operations efficacy

AI applications reproducing known results with the primary intention to create bottom-line impact enable operations efficacy, e.g., by automating repetitive tasks, identifying fraudulent behavior, or making knowledge accessible in real-time. For example, JP Morgan has been able to save 360,000 work hours by automating part of their lawyer work by leveraging an operations efficacy application.



JP Morgan

Machine Learning System COIN autonomously reviews and interprets commercial loan agreements.

Value: Saved 360,000 hours of lawyers' and loan officers' work with an AI that needed only seconds for the same work and decreases susceptibility to error.

5.3 Customer efficacy

Top-line impact can be delivered through AI applications targeted at customer efficacy by employing AI to perform actions that are known to increase customer satisfaction and consequently conversion and loyalty. Such tasks include in particular sales, marketing, and pricing automation, as illustrated by the case study of The North Face.

The North Face

The North Face leverages IBM's Watson as a personal shopping assistant in their online shop to recommend products in natural language based on qualifying questions about location, temperature, etc.

Value: The solution supports customers in finding the right product in a fast and convenient manner and has yielded an increase in click-through rates to 60%.

5.4 Operations discovery

AI applications for the generation of unknown results with the primary intention to deliver bottom-line impact enable operations discovery. Such applications may e.g., discover new insights about process inefficiencies or cost drivers and serve to increase quality or time and cost effectiveness. By implementing such a maintenance expert system, Korean Air has been able to reduce maintenance lead times by 90%.

Korean Air

An expert system that discovers previously hidden relationships and interdependencies in maintenance issues to solve problems faster.

Value: Reduced the number of flight delays and cancellations caused by maintenance issues and shortened its maintenance lead times by 90%.

5.5 Customer discovery

Alternatively, top-line impact can be delivered through AI applications targeted at customer discovery, i.e., discovering new insights, actions or products that serve to strengthen the relationship with the existing customer or the acquisition of new customers. Such tasks can include e.g., the discovery of novel criteria for successful customer segmentation or data-driven product development, as illustrated by the case study of Netflix.

Netflix

Netflix leverages AI to tag its movie content, allowing for a detailed analysis of play-and-search data, giving Netflix an understanding of what a user really likes about a movie. Netflix combines the usage data with metadata and ecosystem data, such as what is trending in the news, in order to identify success criteria for original content production.

Value: Netflix's original content rates 11% higher than its licensed content, yielding increased customer engagement and reduced churn.

Video No. 5253

6. Insurers have yet to unlock the full potential of AI

In view of the fact that businesses across industries are reaping real benefits from AI, it is uncontested that AI will also be a key enabler for insurance businesses to equip themselves for the challenges and opportunities of their digital future. High labor costs, regulatory requirements, intensifying competition with InsurTech startups, and changing customer expectations are just some of the issues that can be addressed by leveraging AI. Yet, the insurance industry is lagging behind tapping into AI's potential compared to other industries such as life sciences, retail, and manufacturing.[26] By looking at the insurance value chain (see Figure 11), it becomes clear that there are numerous entry points and possibilities. In order to obtain an overview of the industry's current status quo and put one's own efforts as well as future value options into perspective, we analyzed the insurance industry based on our value framework in the upcoming chapter.

The insurance industry is lagging behind tapping into AI's potential compared to other industries such as life sciences, retail, and manufacturing.

Figure 11: Potential AI use cases for the insurance value chain (illustrative selected examples, technology's state of the art could be less advanced)

Insurance Value Chain	Product development	Marketing & sales	Underwriting & risk-rating
Text analytics & NLP	Scan and structure existing policies and product descriptions to develop future products faster and more efficiently	Analyze customer feedback based on support calls & social media posts to develop new marketing campaigns	Scan for ambiguities and rate risks in insurance applications based on claims to detect fraud faster
Pattern/Anomaly detection	Derive patterns for new products based on customer feedback analysis in to create more targeted products	Identify customer segments for personalization based on cluster analysis of feedback to target specific customer groups	Predict premiums based on past risk assessments to make risk assessment more precise
Recommendation engine	Analyze customer buying behavior based on sales data following product recommendations to improve offerings	**Provide new sales leads based on social media and purchase data in order to gain new customers**	Suggest risk categories for customers based on previous claims and events to prevent human errors
Conversational service solutions	Use feedback data based on customer conversations with virtual service agent to improve future products	Use virtual sales agent to consult and accompany the sales process in order to achieve higher sales targets	Use a chatbot to lead risk related conversations based on natural language data base to obtain specific facts from customers
Speech recognition	Identify customer pain points with products through speech analytics of feedback to improve future products	Analyze customer speech – emotion detection included - based on lead calls in order to improve personalization	Detect fraud based on voice analysis of customer calls in order to improve security measures
Image and video analysis & facial recognition	Analyze customer emotions and reactions based on customer interview videos to test new product	Recommend marketing messages for promotion videos based on public video analysis to improve marketing effectiveness	Predict risk based on image/vide analysis to improve accuracy
Natural language generation	Generate new policy descriptions for new products based on past documents to increase operations efficiency	Generate marketing messages in various styles based on public advertisements to improve targeting	Generate reports and written documents based on internal reports to improve operations efficiency

Potential use case: Lead management

AI can provide support in pointing out positive leads to both sales and marketing by pulling value from respective data and indicating potential quality leads that might not have been considered before. Insurance firms can achieve competitive advantage by additionally enriching internal data with a multitude of sources e.g., information from social media campaigns or weblog clickstreams. AI can also deliver additional value in offering personalized content by predicting e.g., potential spend, suggested campaigns, and personalized products for cross- and upsell to maximize sales and new revenue. The personalized lead interaction with AI can also be applied in call centers.

Potential use case: Fraud analytics

Annual fraud-related costs in the insurance industry are estimated to add up to billions of euros and an estimated amount of 10% of their overall claims expenditure. AI can be used to, e.g., assist insurers during the claims handling process by querying the asserted events of an incident: If a driver involved in a car accident indicates it was raining at the time of the event, negatively impacting his braking distance, AI can check weather reports to confirm whether this was the case. If a policyholder's assumed conditions are invalidated by the AI's searches, this indicates that the claim could be fraudulent; the system can thus appropriately flag the case for further investigation by a human insurance agent.

Customer servicing	Claims management	Financial assets	Operations
Generate structured feedback reports based on customer support requests to save time & costs	Generate structured data sets based on claims reports to process claims faster	Detect opportunities and issues early on based on analysis of news and social media data to improve timely reactions	Transform process descriptions into structured data that can be analyzed to track effectiveness of processes
Provide automatic matching of answers to customer inquiries based on past customers questions in order to automate service	**Validate claims by checking external data sources e.g., weather reports for validation to save costs of wrong evaluations**	Integrate robo advisory into portfolio decisions based on automatic market analysis to detect market anomalies faster	Predict process workload based on historical data in order to prevent bottlenecks
Provide issue solving recommendations to customers based on clustered historical service data to save time	Recommend template for incoming claims based oWn historical similar claim reports to process claims more effectively	Integrate robo advisory into portfolio decisions based on automatic market analysis to recommend financial actions and decisions	Recommend suitable candidates based on social network data to improve future recruiting purposes
Integrate virtual agent onto customer service platform based on product and service data to improve customer experience	Provide chatbot interface for claims reporting based on natural language base and historical claims data in order to improve efficiency	Supply internal, digital personal assistant based on financial data for employees to look up specifics	Supply internal, digital personal assistant for scheduling of meetings to improve internal efficiency
Improve customer communication directly based on emotion detection during customer calls to improve service	Automatic text production of speech claims including emotions and behavior based on phone calls in order to improve efficiency	Analyze important investor calls of financial asset providers to detect potential issues early on	Produce automatic protocols and key results based on spoken word during meetings in order to improve efficiency
Analyze customer emotions during service calls based live audio feeds to improve communication with customers	Define damage severity based on photos taken by customers during claims reports to improve speed and convenience	Inform market forecasting by evaluation news reports based on public sources to improve forecasting accuracy	Warn employees of workplace incidents based on security camera feeds to improve workplace safety
Generate customer emails as responses based structured input data to optimize workload for employees	Generate automatic claim reports based on structured data to optimize workload for employees	Generate investor financial reports based on structured input to optimize workload and consistency	Generate internal company information material and blog entries based on structured input to increase transparency

Potential use case: Automated input management

One use case to use the steadily growing amount of available data for insurance companies is automated input management, including input recognition, clustering and routing. By using Artificial Intelligence, it is possible to design a more efficient input management that avoids subsequent manual work and that is able to learn from previous events. The new kind of input management can be divided into three major steps: Data Analysis – Data Clustering – Routing. These enable the customer interface to route each issue to the right internal contact or solution provider.

Potential use case: Intelligent virtual assistants

Companies have used chatbots for customer service for a number of years, typically to replace or assist live agents in call centers for first level support or as an alternative to point-and-click interfaces for customers visiting websites. With the advances in Natural Language Understanding and Processing, this technology is now capable of being used in more complex customer communication, providing more and more natural conversations which rarely differ from those with humans. However, as long as there is no Artificial General Intelligence, customers will be routed to real people when it comes to more complex issues.

6.1 The current status – insurers leverage AI for improved efficacy

Recent efforts by insurers to implement AI have been focused on automating repetitive tasks by using AI applications to replicate known answers, yielding both top- and bottom line improvements. Consequently, leading insurers are already achieving operations and customer efficacy through the application of AI.

Operations efficacy

Among the most mature applications of AI in insurance is the automation of claims handling processes (Figure 12).

Traditionally, the claims processing department is the most labor intensive and therefore the largest cost center for insurers. Meanwhile, work in claims processing is highly standardized and repetitive – and therefore extremely eligible for automation through AI. Consequently, there are both great incentives and high feasibility for insurers to automate claims processing. Typically, insurers' legacy systems are already capable of (partially) automated processes in quotation, contract, and claims. However, the modern AI applications can improve content recognition, prioritize more intelligently, and even increase customer satisfaction by significantly reducing response time.

The Case Study of Fukoku Mutual Life (Exhibit 1) serves to illustrate how insurers can reap these benefits from the application of AI in claims processing.

Figure 12: Selected case studies of AI-enabled claims automation

Basler Versicherungen

use AI to automate parts of their glass damage claims processing including payment transactions.

Zurich UK

have launched a pilot AI application to automate their injury claims processing.

EXHIBIT 1: FUKOKU LIFE

In February 2017, Japanese Life insurer Fukoku Mutual Life announced that it has introduced an AI application based on IBM's Watson explorer to boost its operations efficacy in medical claims processing. The application is tasked with calculating accurate pay-outs based on details of the administered procedure, period of hospitalization, medical history and insurance conditions. The application thus accesses medical certificates, hospital bills, and internal claims history files and scans the insurance contract for special coverage clauses to prevent payment oversights. The accurate pay-out is calculated and is submitted to a member of staff who approves and then releases the pay-out.

The application increased productivity by 30% and yielded improvements in accuracy of pay-outs. Fukoku Life expects to see a return on investment in under two years, realized through annual savings of JPY 140M. Additionally, the insurer aims to increase customer satisfaction scores through reduced lead time of pay-outs.

UNDERLYING USE CASE:

"Derive and calculate pay-outs based on company data (historic claims files, contracts) and third party data (medical certificates and hospital bills) in order to achieve accurate and efficient claims processing and fast pay-outs."

Customer efficacy

Other currently popular AI applications for efficacy gains include customer self-service solutions like biometrics authorizations and even more prominently chatbots – as a variety of existing insurance case studies demonstrate (Figure 13).

According to Gartner, by 2019, 40% of enterprises will be using chatbots to facilitate business processes using natural-language interactions.[27] The advantages of chatbots include standardized and consistent quality of service, 24-hour service for customers as well as reduced costs. Beyond business-to-customer applications, chatbots are increasingly being implemented in the insurance industry for internal usage to automate processes in HR, IT, and operations, or to assist knowledge workers in accessing expertise in real-time.

The case study of Aetna (Exhibit 2) gives detailed insights into how a chatbot can be set up and trained in order to deliver such efficacy gains.

Figure 13: Selected case studies of AI-enabled customer self-service solutions

EXTERNAL CUSTOMER-FACING APPLICATIONS

Axa

have introduced a chatbot on their Health App "Xtra", which advises users on fitness and nutrition tracks, and answers questions regarding health goals.

Manulife

have introduced a biometrics authorization application that is able to identify users based on their unique voice profile.

PNB MetLife

have introduced a medical chatbot on Facebook Messenger that informs users of cancer and heart disease risks and simplifies medical information on these. It can also calculate a user's health quotient by asking the customer questions.

INTERNAL CUSTOMER-FACING APPLICATIONS

Versicherungskammer Bayern

leverage AI in order to increase the effectiveness of their customer service by letting Watson sort and classify customer emails.

Anthem

use IBM Watson to assist doctors with creation of treatment plans.

EXHIBIT 2: AETNA

As early as 2010, American insurer Aetna introduced their virtual assistant "Ann" to improve their customer efficacy. Ann was developed by NextIT and primarily intended to act as a welcome guide on Aetna's website, engaging customers and answering login and registration questions. Today, Ann helps customers find a doctor, estimate the cost of services, answer questions about claims, ID cards and more. She answers around 20,000 questions daily and can provide responses in written or spoken form, although questions can only be asked via text. Aetna has installed a member of staff who can check Ann's answers and enrich them whenever necessary. If Ann does not know the correct answer, she directs the customer to a dedicated customer service agent. The bot has started off with achieving high quality responses only 35% of the time but has quickly improved to 80% within a year. Ann has enabled customers to resolve issues directly via the website, without having to call an agent and waiting in line during specific hours.

UNDERLYING USE CASE:

"Answer customer questions based on company data (user profiles, product info, doctor database) and customer data (text-based customer question sets) in order to provide timely, personal, and helpful customer service."

A review of the current AI landscape reveals that the majority of prominent use cases realized by traditional insurers today, are focused on achieving efficacy gains and that these efforts are already yielding tangible benefits.

To keep up with the industry, insurers must continually strive to implement and improve their AI efficacy endeavors. Applying the Use Case Formula to analyze the successful AI initiatives of their competitors enables insurers to abstract generic AI use cases that can be replicated and serve as a starting point for newcomers in the AI space.

6.2 The future of insurance – insurers have yet to leverage AI for discovery

Large scale AI applications in the area of operations and customer discovery are still rare in the insurance industry today. Leveraging AI to generate new insights in the form of previously unknown answers or actions is simply more difficult to realize from a technological point of view and requires a greater amount of creativity.

However, a few cross-industry players such as Google, as well as innovative InsurTech start-ups, such as Lemonade or Oscar, have already started invading this area to seize value. For example, Oscar, a health insurance and tech company, is using claims data to make inferences about which doctor performs which procedure at what frequency – enabling them to discover narrow specialty areas and consequently refer patients deliberately to the right specialist.

Oscar and other new market entrants are changing the rules of the game with customer-centric design, exceptional engagement, and cost-effective operations. Although revolutionary in the insurance industry, their business models are often inspired by consumer business innovations. As a result, insurers who want to lead in their industry beyond the current status, must turn to consumer businesses as a source of inspiration.

Case studies of consumer-led companies leading in the application of AI outside the insurance industry serve as an indicator of what is already technologically feasible today. Analyzing their case studies to identify underlying AI use cases can serve as valuable starting point for ideation by transferring the identified use case into the insurance context.

Operations discovery

In operations discovery, AI can unlock value through novel insights that lead to cost reductions. In this realm one capability stands out as a key differentiating competitive advantage for insurance businesses in the future: fast and cost-effective product innovation and design. In the era of rapidly evolving customer needs and rising product personalization, insurance businesses are struggling more than ever to keep pace with customer demand in a cost-efficient manner. Reductions in lead times and product costs will hence become even more crucial in the digitalized future.

While the application of AI in this realm is still mostly untapped in the insurance industry, the case study of Stanley Black & Decker (Exhibit 3) serves as an illustrative benchmark for leading edge insurance companies who may begin to leverage generative AI solutions for product design.

JEFF KOWALSKI | CTO AT AUTODESK

Generative design is a departure from the way that we have traditionally done design, but these technologies are not a threat, they're more like superpowers.

EXHIBIT 3: STANLEY BLACK & DECKER

Early in 2017, Stanley Black & Decker, a company producing tools for industry and household purposes, released a statement that they have been working on opportunities to leverage AI in product design to decrease time spent on development, thereby yielding operations discovery. An AI-powered algorithm helped Stanley Black & Decker's employees to redesign a tool for electricians for fixing electrical and telephone lines. Previous tools had been almost 7 kg, which made them too heavy for workers. The company used an AI enhanced generative design software from Autodesk, which designs new products via mimicking nature's evolutionary approach. The algorithm explores all possible product combinations, which can be thousands or millions of design choices to find the best one, matching a set of user requirements such as light weight. The AI learns throughout the process which combinations work best and eventually comes up with the most effective and efficient design. The human designer can then adapt the choice if needed. Generative design may even go beyond human capabilities of design creation and therefore not only increase speed and reduce the cost of product development but may also have a positive impact on product quality and desirability.

UNDERLYING USE CASE:

"Create new products based on company data (previous product components, product requirements, employee feedback data) in order to deliver innovative products to the market faster and at lower cost."

The case study of Stanley Black & Decker demonstrates that AI technology is ready to unlock opportunities for shortened product creation lead times as well as costs and thereby to gain significant bottom and top-line line effects. Although the tools manufacturing industry has little in common with the insurance industry, the application of the Use Case Formula can help to transfer Stanley Black & Decker's successful AI endeavor into the insurance context. Similarly to Stanley Black & Decker, insurers can datafy their product development process in order to automate product design. With access to diverse data sources as well as a set of pre-defined product requirements, AI can design the optimal product for any target group or even individual customer – at no incremental cost.

Potential insurance use case:

"Design new insurance policies based on company data (e.g., previous policies, customer feedback, claims data), public data (e.g., forums, Google search data, demographics statistics) and customer data (e.g., smart home, wearables, phone usage) in order to deliver more diverse and tailored insurance products to the market faster and at lower cost."

Customer discovery

Within the realm of customer discovery, AI can deliver value by unlocking revenues through previously unknown insights. This may be the most game-changing area for insurers to leverage AI in the future: The rise of self-driving cars, the sharing economy, social brokering, and comparison platforms are just some of the threats to their traditional profit models insurers are facing. It is therefore undisputed that insurers will have to identify and unlock new revenue streams and AI may be the needed enabler for redefining the business.

While customer discovery applications of AI are still rare in the insurance industry, the case study of Under Armour (Exhibit 4) illustrates not only the technological feasibility of such applications, but also serves as a benchmark for insurance companies who aim to progress to sustainable business models.

SUNDAR PICHAI | CEO AT GOOGLE

We've been building these incredible capabilities, be it search, the knowledge graph, our understanding of natural language, image recognition, voice recognition, translation. Particularly over the last three years, we have felt that with Machine Learning and Artificial Intelligence, we can do these things better than ever before.

EXHIBIT 4: UNDER ARMOUR

In a transition from its traditional fashion manufacturing business model towards a data-driven business model, Under Armour has partnered with IBM to develop "UA Record" - a cognitive coach that serves as a personal health consultant, fitness trainer and assistant by providing users with timely, evidence-based advice regarding nutrition, activity and sleep. Under Armour has developed a range of wearable devices, including a fitness tracker, heart rate monitor chest strap, and smart scales that gather user behavior and health data. The coaching is based on a comparative model, clustering users based on criteria such as age, gender, and activity level in order to provide relevant recommendations for users. The model will, over time, be able to tap into additional data pools to derive novel connections between e.g., weather and training behavior. UA Record not only serves to strengthen customer relationships and build emotional connections but is also able to collect relevant data from customers to cater to needs more efficiently in the future.

UNDERLYING USE CASE:

"Recommend sport activities and sleep behavior based on company internal data (customer profile, product usage data), customer data (nutrition info) and public data (weather) in order to increase customer health and determine future needs more effectively."

Under Armour's case study powerfully demonstrates how AI can open up opportunities for completely new, profitable business models centered on data and user interactions – even for a business with its origin in the sports fashion manufacturing industry. Applying the Use Case Formula to the case study of Under Armour, the underlying use case can be used to transfer this data-driven business model into the context of insurance. Like Under Armour, insurers can leverage diverse data pools to help customers reduce health risks. However, insurers can go one step further by leveraging AI to prevent yet unknown risks in all areas of life: Health, transport, household, finances and more. Insurers will then no longer be confined to reimbursing materialized risk but instead prevent loss events from occurring in the first place. To become an effective and trusted assistant in preventing personal loss events for the customer, the insurer needs to build a much closer relationship – for which the use of AI for meaningful analysis of big data will be the enabler.

Potential insurance use case:

"Suggest risk prevention measures based on company internal data (e.g., customer profiles, claims files), public data (e.g., demographic statistics, geographical statistics, financial data), customer data (e.g., location tracking, wearables data, pictures) and third party data (e.g., Facebook, Instagram) in order to increase customer safety."

A review of applications of AI in insurance reveals that little tangible and meaningful impact is yet created with generative solutions in the realm of operations or customer discovery. However, selected case studies from consumer-led companies serve to demonstrate that the technological feasibility is already given today. To innovate and lead in their industry, insurers can turn to state of the art examples in other industries as a source of inspiration – the Use Case Formula can help in this endeavor by distilling the most relevant use case characteristics to ideate analog insurance use cases.

7. Act now

Change is here. It is evident that AI has already begun to create a tangible impact in insurance. Looking beyond the insurance industry, however, offers a glimpse into the real magnitude of the AI-enabled disruption still to come. AI technology holds the potential to fundamentally redefine the industry on all levels – challenging traditional cost structures, enabling novel relationships with end-customers and much more.

For those who are yet to embark on their journey towards an artificially intelligent future, the time to act is now. For leaders looking to steer their organizational ships into the auspicious waters of AI, the following three principles provide guidance:

1. **Data is the key:** Before getting started with any AI use case, it is crucial to determine the type, quantity, and quality of data at hand. This will provide you with an initial idea for feasible and relevant use cases to pursue. But don't throw in the towel if your business doesn't have access to the data required to follow through with the use cases you envisioned. Consider accessing public data sources or partnering with a business that has the data you are looking for. Alternatively, you can develop a strategy to start gathering valuable data, e.g., by "datafying" previously analog processes or developing a consumer-facing digital product that serves as a "vehicle" to gather user data.
2. **Start small:** There is no need to go overboard and start selecting the most complex use cases in an attempt to gain as much value as possible. By starting small you can release an application faster and then build on it over time. AI applications can be iteratively extended to scale, so companies can expand their capabilities and capture increasing value over time.
3. **Don't be afraid of failure:** AI projects can be particularly challenging in that they need to tackle the social stigmatization of the technology, require interdisciplinary collaboration and bear high cost and time investments. In order to succeed, it is crucial to accept failure as an integral part of innovation that contributes to organizational learning. Only by adopting a "fail fast, fail early" mindset, can time and cost investments be kept in check.

What steam power has been to industrial manufacturing, Artificial Intelligence will be to insurance. Ask yourself this question: What would have happened to your manufacturing business after 1800 if you had never used steam? True innovators are those who look into the future and act before it arrives!

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Sources

1. CB Insights (2017): The State of Artificial Intelligence; URL: https://www.cbinsights.com/research/report/artificial-intelligence-trends/
2. CB Insights (2017): The State of Artificial Intelligence; URL: https://www.cbinsights.com/research/report/artificial-intelligence-trends/
3. IDC (2017): Worldwide Semiannual Cognitive/Artificial Intelligence Systems Spending Guide
4. DeepMind (2016): DeepMind AI Reduces Google Data Centre Cooling Bill by 40%; URL: https://deepmind.com/blog/deepmind-ai-reduces-google-data-centre-cooling-bill-40/
5. U.S. Department of Transportation (2016): ODI RESUME ; URL: https://static.nhtsa.gov/odi/inv/2016/INCLA-PE16007-7876.PDF
6. eMarketer (2017): Alexa, Say What?! Voice-Enabled Speaker Usage to Grow Nearly 130% This Year; URL: https://www.emarketer.com/Article/Alexa-Say-What-Voice-Enabled-Speaker-Usage-Grow-Nearly-130-This-Year/1015812?ecid=NL1001
7. Gartner (2016): Gartner Predicts 2017
8. O'Reilly (2017): The New Artificial Intelligence Market
9. IBM Institute for Business Value (2016): Understanding customers and risk
10. IBM Institute for Business Value (2016): Understanding customers and risk
11. IBM Institute for Business Value (2016): Understanding customers and risk
12. IBM (2017): 10 Key Marketing Trends for 2017
13. Deloitte UK (2015): Insurance disrupted
14. Deloitte (2017): EMEA Insurance data analytics study
15. Wired (2016): Google's AI wins fifth and final game against Go genius Lee Sedol; URL: https://www.wired.com/2016/03/googles-ai-wins-fifth-final-game-go-genius-lee-sedol/
16. Tim Urban, Wait but Why (2015): The AI Revolution: The Road to Superintelligence; URL: https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-1.html
17. Wired (2016): Google's AI wins fifth and final game against Go genius Lee Sedol; URL: https://www.wired.com/2016/03/googles-ai-wins-fifth-final-game-go-genius-lee-sedol/
18. Tim Urban, Wait but Why (2015): The AI Revolution: The Road to Superintelligence; URL: https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-1.html
19. Google (2012): Using large-scale brain simulations for machine learning and A.I.; URL: https://www.blog.google/topics/machine-learning/using-large-scale-brain-simulations-for/
20. Deepak Pathak, Pulkit Agrawal, Alexei A. Efros, Trevor Darrell, Cornell University (2017): Curiosity-driven Exploration by Self-supervised Prediction
21. Yaniv Taigman, Ming Yang, Marc'Aurelio Ranzato, Lior Wolf (2014): DeepFace: Closing the Gap to Human-Level Performance in Face Verification
22. Capital One (2016): Bank on Alexa with Capital One's Expanding Skill for Managing Your Money; URL: https://www.capitalone.com/onefocus/bank-alexa/
23. Forrester, TechRadar (2017): AI Technologies Q1
24. Forbes (2011): Google's "Infrigenovation" Secrets; URL: https://www.forbes.com/sites/scottcleland/2011/10/03/googles-infringenovation-secrets/
25. IBM (2016): The biggest data challenges that you might not even know you have; URL: https://www.ibm.com/blogs/watson/2016/05/biggest-data-challenges-might-not-even-know/
26. Techcrunch (2016): Facebook chose to fight fake news with AI, not just user reports; URL: https://techcrunch.com/2016/11/14/facebook-fake-news/
27. O'Reilly (2017): The new data-driven Artificial Intelligence Market
28. Gartner (2017): Four Use Cases for Chatbots in the Enterprise...Now

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