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# Artificial Intelligence Across Industries

How AI Is Transforming Telco, Retail, and Financial Services



**Mike Barlow, Editor**



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# Artificial Intelligence Across Industries

*How AI Is Transforming Telco, Retail,  
and Financial Services*

*Mike Barlow*

Beijing • Boston • Farnham • Sebastopol • Tokyo

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## **Artificial Intelligence Across Industries**

by Mike Barlow

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# **Artificial Intelligence and Deep Learning Move Toward Mainstream Adoption**

*Editor's Note: This report is based on contributions from Jeremy Barnish, Michael Kaplan, Lisa Lahde, Alex Sabatier, Andy Steinbach, and Renee Yao of NVIDIA. It was compiled and edited by Mike Barlow.*

The artificial intelligence (AI) revolution is here. It's happening now, and the world will never be the same. A convergence of technology leaps, social transformations, and genuine economic needs has overcome decades of inertia, lifting AI from its academic roots and propelling it to the forefront of business and industry.

Make no mistake; every nook and cranny of the modern economy will feel the impact of AI. All of the traditional industrial sectors—energy, transportation, telecommunications, healthcare, financial services, manufacturing, mining, logistics, construction, retail, entertainment, education, information technology, government, and all of their various subsectors—will be transformed by the AI revolution.

We are truly at the opening stages of a rare paradigm shift. And we are already experiencing some of the pain that invariably accompanies great shifts in human culture.

## How Did We Get Here?

The origins of AI stretch back to the post-World War II era. Visionaries such as Alan Turing, John McCarthy, and Marvin Minsky laid the foundations for AI and created much of the initial buzz around the idea of machine intelligence.

But the technology for creating practical AI systems didn't exist. What followed was a long and dispiriting period called the *AI winter*, in which AI was reduced to a cultural meme evoking images of a dystopian future run by killer robots.

Fortunately, the dream of AI remained alive. The development of open source software frameworks such as Hadoop sparked a revolution in analytics using unstructured big data.

Suddenly, data science moved from the basement to the boardroom as organizations saw the potential economic benefits of big data. Overnight, it seemed as though everyone was talking about the *three Vs* of big data: volume, velocity, and variety.

The arrival of practical frameworks for handling big data revived the AI movement, given that many of the underpinning techniques of AI (such as machine learning and deep learning) feed happily on big data.

The rise of data science led to the renaissance of AI. But, there were unintended consequences, of course. There wasn't enough hardware to support the sudden spike in demand for AI-powered solutions. Central Processing Units (CPUs) weren't designed to support the workloads imposed by machine learning and deep learning. As a result, AI developers turned to Graphics Processing Units (GPUs), which had faster and more powerful chips.

It was natural for NVIDIA, with its deep experience in building lightning-fast chips, to become a positive force in the AI renaissance. In addition to chips, NVIDIA provides systems, servers, devices, software, and architectures. The ability to provide a full range of components makes NVIDIA an essential player in the emerging AI economy.

# The Shift to Pervasive AI

Not surprisingly, the first companies to take advantage of the potential of AI at scale were large organizations such as Google, Facebook, and Amazon. The efforts of those early adopters attracted wide attention and inspired other organizations to begin exploring and developing AI solutions.

At this point, it's reasonable to assume that AI is still in the early phase of the *hype cycle*, but heading rapidly toward a more stable and productive plateau.<sup>1</sup> It's also fair to suggest that the AI phenomenon has been somewhat immunized by its long "winter," and will consequently spend less time in the inevitable *trough of disillusionment* phase of the hype cycle.

The high levels of interest in AI and the growth of investments in AI-related products clearly point toward a genuine boom in AI development. That boom will invariably translate into greater demand for hardware and services capable of serving the needs of growing communities of AI developers.

The popularity of consumer products such as Amazon Echo and Google Home demonstrates the acceptance of AI and the beginning of a shift toward a culture in which AI will be everywhere, both surrounding and supporting us. AI is becoming pervasive and, as a result, becoming more normal. In a very real sense, AI is becoming an integral part of our environment and our daily lives.

In every technological shift, however, some industries respond more quickly and aggressively than others. The AI revolution is following the same pattern; some industries are leading, whereas others are lagging.

The disparity in progress isn't surprising, given that different industries face different challenges and view the world from different perspectives. That said, it seems safe to predict that within a fairly short period of time, most industries will be using some type of AI on a regular basis.

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<sup>1</sup> This terminology is based on the familiar Gartner Hype Cycle. See <http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp> for a more detailed explanation of the technology *hype cycle*.

In the next sections of this report, we'll focus on three of the leaders: telecommunications (telcos), retail, and financial services.

## Telcos: More Than Pipelines

The promise of content available on any screen has become a reality enabled by advances in network technology, a proliferation of new content providers, and the continued explosion of mobile devices and the Internet of Things (IoT). There are now **almost as many cell-phone subscriptions** as people living on Earth, which hints at the scale of transformation ahead.

Core connectivity drives revenue for most telecommunications carriers. Their central focus is responding to demand with high-quality voice and data services that are both reliable and affordable. The industry tends to constantly worry about two primary challenges:

- Rationalizing networks
- Offering improved and expanded services

Consumers have shown an appetite for more connections, from smart homes (including lighting, security, entertainment) and connected cars, all the way to smart cities (parking, street lighting, security, transportation, and a wide variety of public services). Realizing the potential for significant economic gain, carriers want to be more than just the pipe: they want to capitalize on all forms of data and content, whether that's streaming video over cellular, TV, and high-speed internet at home for entertainment and gaming, or access to the infrastructure of an entire city.

With customer relationships now stretching far beyond mobile voice and data, carriers are focused on the battle to continually expand and upsell services. They also are partnering with various businesses and public utilities to offer new services. Their overarching goal is providing highly personalized customer experience with maximum "stickiness"; that is, high customer retention and low churn (loss to competitors).

On the business side, carriers are searching for high-value differentiating services such as Content Delivery Networks (CDNs) or Virtual Private Networks (VPNs). Traditional companies are very aware that they're competing with agile competitors, such as Google or Amazon, and are looking to build an infrastructure that is agile

enough to bring up new services in minutes or hours versus weeks or months.

Carriers often need large datacenter staffs running both their enterprise and telco networks. Consumer data usage has increased dramatically, and, as a result, the investment in customer service, fifth-generation cellular networks, IoT, autonomous vehicles, smart cities, and international expansion now runs into billions of dollars. Carriers recognize that they must use those investments to provide next-generation services, but they are struggling to identify the best strategies for moving forward.

One area that is always ripe for improvement is operations. Many telcos still rely heavily on manual processes, but they see the potential for using automation and AI-powered solutions to reduce costs, increase productivity, and drive more value.

Carriers are also moving away from proprietary, hardware-based network equipment to server and network virtualization functions, and open-software-based technologies. The rationale is to allow them to manage their networks more efficiently and effectively via automation while being more responsive to consumer demands.

## **Opportunities in Data Analytics, Innovation, and Research**

Large telcos generally tend to see opportunities in data analytics, innovation, and research groups, where proof of concepts for new AI and deep learning services are being triggered by specific applications that need to be accelerated, or by the use of a particular research framework in deep learning. Technology and IT personnel are then pulled in to validate the solution.

Telcos already use large numbers of CPUs and servers in their datacenters. Much of their interest in GPU computing is initially driven by applications and use cases showing the potential for positive impact in critical areas such as billing, customer support, subscription management, and “over the air” (OTA) software updates.

GPUs are already having an impact in accelerating analytics and customer service processes. In some cases, for example, GPUs are making the speeds of queries a hundred times faster.

Additionally, every telco has millions of phones and thousands of software versions to track and update. Analyzing OTA updates and

keeping track of the installed base can be arduous and time intensive.

With GPU technologies, telcos are now able to accelerate those queries dramatically. One real example in use today with a major carrier uses data from 85 million subscriber identity modules (SIMs) in phones to track location and software versions to update necessary security patches.

## Improving Operations and Maintenance

One of the first applications for AI and machine learning in the telco space was network management and expert systems. AI has been used to elevate the efficiency of infrastructure, and some of the world's first practical expert systems based on AI were employed to improve operations and maintenance of telco networks and services.

Software-Defined Networks (SDNs) lend themselves to automation. As the IoT expands, the size of communications networks will grow to accommodate the increased scale and complexity of IoT data traffic. With this growth will come a corresponding opportunity for the application of AI solutions. Based on their expectations of radical growth, telcos are looking to build self-optimizing networks based on current live or modeled network conditions.

Telcos are using GPUs for deep learning use cases such as image detection, natural-language processing (NLP), and video analytics. For example, image detection and video analytics are used to analyze behavior when a particular type of video is being streamed. Then, the telco or cable provider can alert the customers when, for example, their favorite sports team is playing or when episodes of a new series are available for viewing.

Additionally, telcos will be able to determine which brands are generating engagement and which aren't. They'll even be able to track who changed the channel at the five-minute mark and suggest a reason for the change. That information can be sold back to advertisers, creating new streams of revenue for carriers.

GPUs are also advantageous for NLP solutions that enable consumers to use voice commands for interacting with their devices to find a movie based on their favorite actor, director, or genre.

Soon, more than 300 million smartphones—roughly a fifth of units sold—will have embedded deep learning capabilities, allowing them

to perform highly sophisticated functions such as indoor navigation, augmented and virtual reality, speech recognition, and enhancements to digital assistants such as Siri, Cortana, Google Home, and Alexa.

## Startups and Use Cases in Telecommunications

**Graphistry** is a platform for handling enterprise-scale workloads. It offers effective methods to aid visual investigation: graph reasoning, GPU-accelerated visual analytics, visual pivoting, and rich investigation templating. For example, telcos can use Graphistry to provide heat maps of lines and towers that might be overloaded.

Telcos use **Kinetica** for data management queries. Kinetica's distributed, in-memory database simultaneously gathers, sorts, and analyzes streaming data for real-time actionable intelligence.

**MapD** provides a next-generation database and visual analytics layer that harnesses the power of GPUs to explore multibillion-row datasets in milliseconds. The telco industry uses MapD to correlate call records with server performance data to spot problems in real time, in addition to building ad-targeting profiles.

**SQream** is a GPU database for today's terabyte-scale data needs, acting as an analytical database or as an accelerator to an existing data warehouse. Telcos use it for correlating geolocation data with ad-targeting profiles, matching millions of audience members against active ad units.

**Comcast** has **spoken publicly** about its NLP as the technology behind the X1 voice remote, deploying AI solution to millions of customers.

**Verizon** has applied **MapD** to the challenge of polling all of the smartphones in its network to assess a variety of metrics.

## Seismic Shifts in Retail

The retail industry has been jolted by the advent of powerful new digital technologies and by the demands of consumers empowered by their laptops, tablets, and mobile phones. Underlying the retail transformation are two key trends, both driven by technology.

The first trend is the use of technology to understand the rapidly shifting attitudes and sentiments of highly informed buyers, whose

changing preferences for web and mobile reverberate across the industry. The success of tech-savvy disruptors such as Amazon has placed enormous pressure on traditional retailers and their supply chains.

More than half of Amazon's sales result from suggestions arising from the company's highly sophisticated recommendation engines, which present shoppers with an array of related opportunities based on what's in their basket, what they've searched for in the past, and what other shoppers have purchased in similar situations.

Traditional retailers that want to compete with the Amazons of the world now face the challenge of mining and utilizing their own data to increase conversion rates and revenue. They must understand their customers' behavior in order to find new ways to increase foot traffic or identify innovative new channels via mobile, web, social media, and advertising technology (ad tech). Smart retailers are using big data analytics along with machine learning and deep learning techniques to understand customer behavior and offer choices that will result in more sales and higher profits.

For retailers with traditional brick-and-mortar stores, this translates into analyzing everything from weather and traffic, to where shoppers are spending their time in the mall or on social media, to a highly granular level, and then deciding precisely where to position experienced associates to convert more opportunities into sales.

The second trend involves retailers searching for an efficient operating model to succeed in a digital world. According to a recent study, only 15 percent of consumer packaged goods (CPG) executives currently believe they have the operational capability to rapidly respond to changing market conditions.

## Retail Feels the Impact of the IoT

The IoT has continued to drive an explosion of data from devices to sensors, in stores and on clothes, such as wearable Radio-Frequency Identification (RFID) tags, shelf beacons, smart hangers, smart location-sensing WiFi, and smart, context-aware mobile apps. The amount of data available to retailers doubles every two years, and 90 percent of the retail data now in use is less than two years old.

There is also a continued rollout of innovative new mobile technologies, such as personalized digital assistants, visual search, and virtual

reality fitting systems, creating a huge need for faster, deeper, and more accurate analysis of data.

Legacy retail IT systems were simply not designed to handle the volume and complexity of modern big data. A typical retail scenario can generate millions of real-time simultaneous requests from multiple data silos. Today's users expect real-time streaming and a sub-second responses. But existing data architectures are too cumbersome to deliver the information needed to optimize sales on a large scale.

Retailers are often looking to create an instant, 360-degree view of every customer, and present new kinds of shopping experiences with systems that can interact with consumers based on knowledge of purchasing habits and likely choices. For competitive retailers, the goal is developing new, disruptive products, services, and processes that take advantage of all the capabilities of twenty-first-century data science.

## Real-Time Knowledge

Most retailers understand the value of data and the need for deploying increasingly sophisticated analytics to optimize processes across their supply chains. Additionally, they are beginning to see the need for real-time data analytics and related processes for moving actionable information at extreme speed to the front lines or point of purchase.

New use cases for AI and deep learning are emerging, such as managing inventory SKU proliferation, tracking buyer preference, integrating between supply chain partners, and linking ad tech to physical context and overstock inventories.

Retailers are using GPU computing to significantly shorten data processing time for analytics tasks, to visualize large datasets, in instantaneous ad tech, and to uncover patterns that can reveal new insights in subsecond times. For example, many vendors now offer predictive price and forecast simulations that evolve over time based on competitive and public market data, aimed at increasing revenue by small percentages that add up to millions for large retailers.

## Startups and Use Cases in Retail

**Revionics** is a profit optimization software company that helps businesses use predictive analytics to build customer-focused, competitive sales strategies. Some companies are using a mix of Accelerated Analytics and deep learning to help retailers working on their pricing strategy.

**BlazingDB** is a high-performance SQL database for petabyte-scale needs. Through the use of a distributed and GPU architecture, BlazingDB offers a new generation of SQL. Retailers use it for transactional data of sales, and they are able to easily analyze inventory in SQL databases. It also is used heavily in industry across a variety of analyses. For example, retail organizations run massive profit optimization calculations each day to know what products to distribute to what stores. The intensity of this calculation and the time-sensitive nature of distribution makes large-scale, distributed SQL attractive.

**GoFind.AI** launched a new fashion app that makes shopping for clothes easier. Users snap a picture of something they like, and the app's AI-powered search engine scours over one million products from 1,000 online retailers for the same or similar items. After it is trained, the app's intelligence analyzes patterns, structures, styles, colors, and other details to recommend a product.

**Third Love** is an app with which women can find the right-fitting bra from home using a mobile device and deep learning.

**Volumental** offers computer vision applications for sizing shoes and eyewear to create an individualized retail experience for customers.

**Daisy Intelligence** uses AI to determine what deals a retailer should offer and what the featured product on an ad campaign should be using massive sets of consumer data.

**Stitch Fix** is applying deep learning to match its customers with personalized clothing recommendations. Stitch Fix's NLP algorithms decode written answers from customers' feedback on what they liked or disliked about each item. It then uses this data to make better recommendations to the next shipment.

**ebo-box** uses deep learning to help consumers shop for gifts by learning about the gift-givers and recipients and combining that with data collected about general user preferences in the market.

## Financial Services Set a Fast Pace

The financial services industry has experienced an unprecedented surge in growth over the past three decades, and now it seems poised for even greater expansion.

The industry itself is composed of three broad segments: investment banking, commercial banking, and insurance. Some large global banks serve both the first two of these, creating a crossover. The governmental bodies that regulate and act as reserve banks are also important and play critical roles in the industry.

Three macro trends are currently driving change across all segments of the industry:

- Fallout from the 2008 to 2009 financial crisis greatly increased risk management requirements, and led to significant changes in regulations such as FRTB (trade book review) and CCAR (capital stress testing) that increase operational costs.
- A wave of agile financial technology startups are shaking up traditional business models, eroding market share, and undercutting margins for incumbents.
- The emergence and deployment of AI, machine learning, and deep learning tools and solutions by large banks and startups is transforming the playing field, and creating opportunities for more innovation.

Taken together, these trends have created a perfect storm for an industry that is likely to experience major continuing disruption over the coming years.

## The Convergence of Fintech and AI

The early years of financial technology (fintech) were largely powered by the rise of mobile technologies and the widespread adoption of smartphones. Today, and for the foreseeable future, it seems likely that AI, machine learning, and deep learning technologies will fuel fintech gains.

Fintech companies will rely on AI to price assets, analyze risk, offer new services, and provide sleek new consumer-facing online or mobile technology customer experiences. For the present moment, fintech is mostly focused on consumer banking and insurance. But

it's only a matter of time before fintech begins influencing other areas of the broader economy.

## A Stealthy Approach to AI

Although it is not widely appreciated, the financial services industry has quietly been an early adopter of AI technologies.

Many financial services companies have already heavily adopted machine learning for applications such as fraud detection, credit risk assessment, NLP, and consumer marketing.

In the last four years, deep learning has emerged as the most powerful class of AI for unstructured data such as images, video, audio calls, geo-location, and time-series data. This type of data is everywhere, created by all online activity, security tick data, and by any device that is part of the IoT. The ability to tap big data in private enterprise *data lakes* for predictive analytics and data mining is changing many industries.

In financial services, deep learning is being applied to such diverse applications as algorithmic trading, optimizing large trade-block execution, high-frequency trading, call-center voice analytics, cyber security, insurance fraud detection, satellite and drone imagery analysis, auto accident claim automation, insurance policy pricing, industrial plant-safety assessment, medical insurance/health risk control, and many others.

One big and exciting frontier for AI in this industry will be the ability to combine both structured and unstructured data to gain new insights. Companies that can combine all of this data at rest and data in motion to create the most complex real-time data models, incorporating the most data, will have a huge advantage in their businesses.

A race is already developing in which financial services companies are competing to incorporate the richest collection data into their AI models in order to gain the deepest insights. Some firms are positioning themselves as AI-enabled “rock stars of finance” and hoping to replicate the success of companies such as Google, Amazon, Facebook, and Baidu.

## GPU Computing Revolutionizes Data Analytics

GPU-based computing is also driving a revolution in advanced data analytics. Sorting and processing large volumes of complex datasets, both structured and unstructured, is still a challenge. With in-memory databases providing fast data access, the computation to sort and compare massive datasets on the fly has become the new bottleneck.

However, new generation of analytical software built on top of GPU-technology, can accelerate database queries and business intelligence (BI) by factors of 100 to 1,000 times. BI queries that took hours or even days on large (CPU-based) database clusters, now can execute queries in minutes or seconds, and on a vastly smaller hardware footprint in the datacenter.

Graph analytics is another area accelerated by GPU adoption as well as the visualization of big data. These new, in-memory GPU-enabled database technologies are being used in risk management, for example, to aggregate GPU-calculated prices and risk quantities, in order to meet some of the regulations and tests mentioned earlier, such as FRTB and CCAR. Graph analytics are being used heavily in insurance casualty risk assessment and also in cybersecurity applications.

It's clear that GPU-enabled computation will become critically important in datacenters to achieve the performance required by newer trends in AI and advanced data analytics. In some instances, it's difficult to determine whether GPU-computing is driving new trends or simply enabling them.

It's certainly true that many of the newer AI and data analytics applications would not have been feasible without the compute power of GPUs. The trend will likely temper the rising cost of maintaining increasingly large and complex datacenters.

## Startups and Use Cases in Financial Services

**Gridspace** is using large-model, deep neural networks to perform voice analytics on call center data. It is able to train deep learning networks to predict outcomes (either positive or negative) and allow companies to provide better call center service. Banks can use Gridspace to reduce risk, streamline customer service interactions, and gain product insights; insurance companies can use it to increase

customer satisfaction, benchmark teams, and improve customer engagement.

**Bonsai** is building a high-level language that abstracts away the lower-level, inner workings of deep learning systems to empower more developers to integrate richer AI models into their work and increase the explainability of AI models. The biggest hurdle to greater adoption of AI is the sheer complexity imposed on developers looking to build greater intelligence into their applications. Bonsai is building a platform to accelerate the adoption of AI globally.

**Neokami** uses AI for tackling complex data security challenges. Neokami's CyberVault "enables companies to discover, secure and govern sensitive data in the cloud, on premise, or across their physical assets." The company uses a multi-layer decision pipeline that includes pattern matching, text analytics, image recognition, N-gram modeling and topic detection.

**DreamQuark** develops artificial intelligence solutions for financial services, insurance and healthcare, building on the most recent advances in machine learning. They develop technologies related to deep neural-networks with sparse architectures that can unveil new patterns inside the input data, which allows for higher levels of accuracy and speed.

**Intelligent Voice** specializes in taking telephone calls and converting them into text by using advanced speech recognition. It offers financial solutions for security, forensic investigation, compliance, and other critical functions.

**Alpaca** offers a reliable scientific solution to the growing retail user base in financial trading, using its team's experience in database, AI, and capital markets. The company uses an optimized time-series database called MarketStore, which is both fast and scalable.

**DeepLearni.ng** uses deep learning to develop AI business intelligence tools that help banks solve problems and engage more effectively with customers. Its platform allows banks to find and suggest the "next best offer" (e.g., mortgage or other type of loan) and to predict and react appropriately when customers don't pay credit cards bills.

**Blazegraph** is a scalable, GPU-accelerated graph database with support for the Blueprints and RDF/SPARQL APIs, available in a range of versions that provide solutions to the challenge of scaling graphs.

Blazegraph exploits the main-memory bandwidth advantages of NVIDIA GPUs to provide extreme scaling that is faster than CPU main-memory-based approaches. The finance industry can use it to detect fraudulent transactions in a fraction of the time required previously.

As mentioned earlier, **Kinetica** has designed a scalable in-memory database capability around GPU technology that provides acceleration of traditional data analytics and also runs AI algorithms. This includes large-scale risk aggregations and multibillion-row joins in subsecond time, fraud, and compliance use cases. For the financial service industry, relevant use cases include the following:

#### *Portfolio management and optimization*

Calculating portfolio risk is mathematically intensive and time consuming (Monte Carlo Analysis). Kinetica enables complex queries in seconds—without the need to move data.

#### *Risk management*

Risk calculations are typically done overnight in batch-limiting real-time response, often resulting in lost opportunities. Kinetica calculates risk using the most current data, almost instantly. Increase portfolio performance and deepen client trust.

#### *Real-time transaction analysis*

Data is becoming too large and too slow for traditional relational database management systems. Kinetica enables customers to measure risk, spot customer behavioral patterns, and discover upsell opportunities in order to lower costs and improve profitability.

#### *Fraud detection*

Analyzes large amounts of varying data in order to expose patterns, as well as crucial exceptions that can flag problems.

## **War for Talent Will Raise New Challenges**

The good news is that investors see the value in applying AI, machine learning, and deep learning techniques to solving real-world business challenges in multiple industries and sectors of the modern economy.

The bad news is that there aren't enough data scientists available. For the moment, almost every AI-based solution requires "humans

in the loop.” The rising popularity of AI-based solutions is creating an insatiable need for people with data science skills, business knowledge, and domain expertise.

Although it seems unlikely that our educational systems will shift gears rapidly enough to produce a new generation of data scientists overnight, there is a silver lining: the next major trend in AI development will likely involve higher levels of automation.

As AI systems become more refined and sophisticated, fewer humans will be required to manage them. In some interesting ways, the future of AI is mirroring the future of transportation. In smart-transportation scenarios, driverless cars and autonomous vehicles are making human drivers less necessary.

AI is likely to follow a similar path, as more automation is baked into each new generation of AI-powered products and services.

## About the Editor

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**Mike Barlow** is an award-winning journalist, author, and communications strategy consultant. Since launching his own firm, Cumulus Partners, he has represented major organizations in numerous industries.

Mike is coauthor of *The Executive's Guide to Enterprise Social Media Strategy* (Wiley, 2011) and *Partnering with the CIO: The Future of IT Sales Seen Through the Eyes of Key Decision Makers* (Wiley, 2007). He is also the writer of many articles, reports, and white papers on marketing strategy, marketing automation, customer intelligence, business performance management, collaborative social networking, cloud computing, and big data analytics.

Over the course of a long career, Mike was a reporter and editor at several respected suburban daily newspapers, including *The Journal News* and the *Stamford Advocate*. His feature stories and columns appeared regularly in *The Los Angeles Times*, *Chicago Tribune*, *Miami Herald*, *Newsday*, and other major US dailies.

Mike is a graduate of Hamilton College. He is a licensed private pilot, an avid reader, and an enthusiastic ice hockey fan. Mike lives in Fairfield, Connecticut, with his wife and two children.