# IoT Case Studies: Companies Leading the Connected Economy

## Part 2 in a Series

Foreword by:
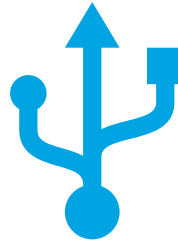**Robert S Schimek**
*Executive Vice President and CEO, AIG Commercial*
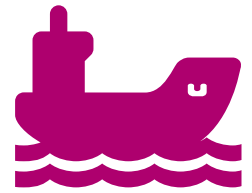
**AIG**

# AIG

# IoT Case Study Summaries

## IBM

Helping well-established brands like Daimler and Whirlpool succeed in the connected economy.

## Ericsson Maritime ICT

Ericsson vessel-to-vessel and sea-to-shore connectivity using IoT enabled systems and crew.
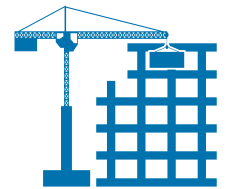
## Daimler

Autonomous trucks reduce driver fatigue and improve road safety.

## John Deere

Farmers used to rely on clouds for rain. Today's digital cloud helps maximize crop yield, optimize seeding, automate harvesting, and more.

## Silverstein Properties

Turning a natural disaster into an opportunity to make tenants happier and more comfortable, while improving building safety and efficiency.

## U.S. Bank

Connecting weight-loss goals with credit scores, financial rewards and more. What does the bank of the future look like?

## Amec Foster Wheeler

Monitoring environmental conditions to improve safety and prevent environmental accidents.

## Human Condition Safety

Today's hard hats and safety goggles could be tomorrow's sensored vests and work sites. Can an IoT enabled ecosystem prevent accidents from happening in the first place?

## ABB Group

How can machines tell us when they are about to break down? Using connected technologies to predict maintenance saves clients time and money.

## Microsoft

Sensor-driven machine learning helps elevator manufacturer thyssenkrupp and industrial automation firm Rockwell Automation benefit from IoT.

## OTOY

Visualizing the industrial future - products, buildings and objects - in new ways.

# Acknowledgments

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# Foreword

**Robert S Schimek**
*Executive Vice President and CEO, AIG Commercial*

The pace of change that innovative technology brings is everywhere we look. Just 10 years ago, no one had heard of an iPhone®.[1] Today, over 700 million devices and eight versions later[2], we are using them to track our health, monitor the kids, control the air conditioner at home while we're at work, and much more. To call it a phone understates its value; I don't know what I would do without mine. Six years ago, Uber did not exist. Today it's providing more than 1 million rides per day[3], is valued over $50 billion[4], and doesn't own the vehicles that its users share. For us as consumers, it's exciting.

Less evident, but more impactful, is how innovative technology, including the Internet of Things (IoT), is adding value to commercial businesses. To understand this trend as something that solely impacts consumers is a myth. In a recent AIG poll of global risk managers from large multinational companies, disruptive technology and cybersecurity were ranked one and two, respectively, when asked what keeps them up at night. Understandably so, they are two sides of the same coin. While some companies may be losing sleep, others are capitalizing on the fact that twice as many U.S. consumers were optimistic about the IoT than were fearful.[5]

The benefits to business are real and here today, as outlined in these case studies. Daimler's driverless truck is licensed for tests on the open road now. ABB's tunnel drilling machines are wired for preventative maintenance, and have already saved their users millions of dollars in unplanned downtime. The farms that John Deere's equipment serves are connected to the cloud at this very moment. Work sites like CitiField are experimenting with Human Condition Safety's sensor technology now. Just to name a few.

In 2016, we'll witness some companies move beyond IoT in the abstract to concrete implementation. Those with their heads still "in the cloud," so to speak, risk falling behind. Just look at the speakers invited for the 2016 Consumer Electronics Show — IBM, General Motors, Samsung and, for the first time, AIG — for further evidence that some commercial businesses are using technology to innovate quickly.
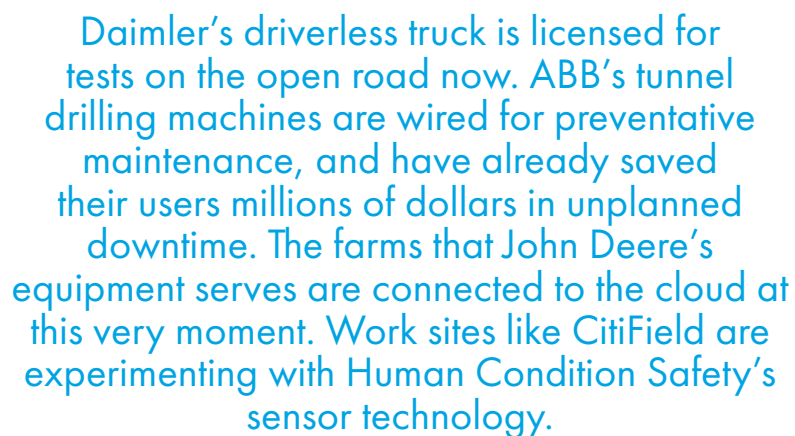
In our conversations with AIG customers around the world, one common thread emerges when we talk about how to successfully implement IoT technologies: The only way to keep up is to learn from each other.

This is true within companies, where keeping pace with rapidly evolving technology and customer demands requires better communication and collaboration. It's no longer sustainable for departments overseeing research and development, product lines, information technology, financial operations and risk management to operate independently of one another.

It is also true at the enterprise level. The IoT is breaking down the barriers that once stood within and between industries. New tools, bigger data sets and changing customer expectations are requiring companies that have never seen each other as partners — even companies that historically have competed with one another — to start sharing information and working together to create innovative solutions for the modern digital age.

Our hope is that by highlighting AIG customers that are implementing innovative technologies including those tied to the IoT ecosystem, we can foster discussion and collaboration within and among previously disconnected industries. It's all part of our vision to become our customers' most valued insurer — not just by providing valuable insurance products and high-quality services, but by bringing our clients together to share insights and learn from one another.

When the solutions are just as innovative and connected as the technology itself, we all win.

Daimler's driverless truck is licensed for tests on the open road now. ABB's tunnel drilling machines are wired for preventative maintenance, and have already saved their users millions of dollars in unplanned downtime. The farms that John Deere's equipment serves are connected to the cloud at this very moment. Work sites like CitiField are experimenting with Human Condition Safety's sensor technology.

# Executive Summary

While much of the media coverage and public attention surrounding the IoT is focused on consumer applications — from wearables that track your exercise to egg cartons that let you know when it's time to stock up — commercial applications present exciting opportunities, too. According to one forecast, spending on industrial connected objects this year alone will total nearly $870 billion, compared with $546 billion for IoT devices on the consumer side.[6]

There are, even by the most conservative estimates, billions of objects and devices connected to the Internet as of this moment. Various estimates place the total number of connected devices between 40 to 50 billion by 2020. All those devices together make up the IoT. While this technological moment is the result of years and years of development in mobile, wireless and processing innovations, all signs point to the reality that we are only in the earliest stages of the IoT revolution.

> Revolutions do not have to be scary. In fact, there is a lot to be optimistic about. As a recent AIG poll found, twice as many U.S. consumers are optimistic about the IoT as are fearful.

Nonetheless, companies across a multitude of industries are pioneering this technology and demonstrating its long-term potential. The improvements in efficiency, analytics, predictive maintenance, troubleshooting and forecasting that have resulted, even in this early stage of IoT implementation, consistently point toward an economy that is more efficient, productive, safe and profitable.

As the insurer of companies of all sizes across the globe, AIG has found that the companies leading the industrial IoT revolution mostly fall into one of two categories of innovation. These categories are not mutually exclusive and will evolve over time.

Companies in the first category implement IoT technologies to improve operations and processes, either internally or throughout an entire supply chain. For example, companies such as Silverstein Properties and U.S. Bank use IoT technologies to improve their internal operations and processes, while companies such as Amec Foster Wheeler, IBM, Human Condition Safety and Ericsson are using it to provide their customers with deeper insights into their operations, their industries and the world around them.

Companies in the second category implement IoT technologies that are transforming their own business models. Thanks to IBM and Microsoft's IoT solutions, companies like Daimler and thyssenkrup are driving change in the industries in which they operate. John Deere, for example, is fostering collaboration across the agriculture industry with IoT innovations that impact every aspect of farming from seed to market.

Both categories can provide valuable insight into the challenges and potential of the IoT, which is why it's so critical that companies and leaders emphasize communication, both within their own companies and with each other. Departments that typically don't interact with each other will need to collaborate to mitigate new IoT risks. Most notably, risk managers and research and development departments must work together to address potential risks created by new connected products and services. Furthermore, closer collaboration between different functions within an organization will help risk managers select insurance products and services that best suit the new risks brought forth by IoT technologies.

To maximize the extraordinary benefits offered by IoT technologies and minimize the inherent risks, it is imperative that successful leaders adopt an open stance with each other. Only then can a true reimagination of daily life take place – whether across industries, at a particular business or in our personal lives.

This phenomenon is not occurring in a vacuum. Its impact is far-reaching, and there are risks associated with the implementation of connected objects. From system vulnerabilities that open up devices and networks to hacking, to the risks inherent in automation, there are new questions and different liabilities that come with the IoT that must be addressed in tandem with its progress.

Ultimately, two things are clear: The IoT is here to stay, and its economic impact will be significant.

One study by Deloitte found that IoT technology could provide as much as $15 trillion in economic value by the end of this decade.[7] For perspective, the entire annual gross domestic product of the United States is $17.9 trillion.[8] In the coming years, industries (and even individual businesses) that aren't impacted by the IoT will become increasingly rare.

In our previous report, "The Internet of Things: Evolution or Revolution?," we explored how the IoT is creating new risks and opportunities for companies across multiple industries. We can learn more about the shape of the future by taking a closer look at the ways leading companies are utilizing connected technology.

While it's impossible to predict all of the details, we know the shape the future of industrial innovation will take. Companies that embrace innovative technologies, including the IoT, are already changing the world we live in. With a commitment to innovation and an openness to disrupt themselves, these few will be best positioned to lead their industries, and may even create new markets.

# Case Studies

## IBM: Driving Enterprise Transformation Through the IoT

IBM is at the forefront of helping clients implement new technologies that not only bring increased operational efficiency, but also recast their customers' experiences, revolutionize business models and enable companies to reimagine how their industries operate.

It's no secret that IoT technologies have developed and evolved over the past decade in drastic ways. Affordable sensors and fast connections have radically increased the amount and type of data available, and altered the way companies collect and use it. More importantly, they have changed the way many conduct business. This technological shift is challenging some of the oldest brands to explore new ways of thinking about their identities, and IBM is playing a central role in driving these transformations.

"We're seeing traditional strategies, technologies and business models change faster than companies can keep up because of this tremendous transformation brought about through the Internet of Things," said Chris O'Connor, general manager, Internet of Things for IBM. "Fortunately, the IoT revolution has also allowed us to give enterprises the ability to access and analyze data quickly and efficiently, creating meaningful insights that benefit business and society alike. Our goal is to harness this fundamental transformation to improve performance, optimize supply chains and enhance service delivery for our customers."

One way IBM is helping its customers realize the potential of the IoT is by providing the technological infrastructure to support the launch of new business lines.
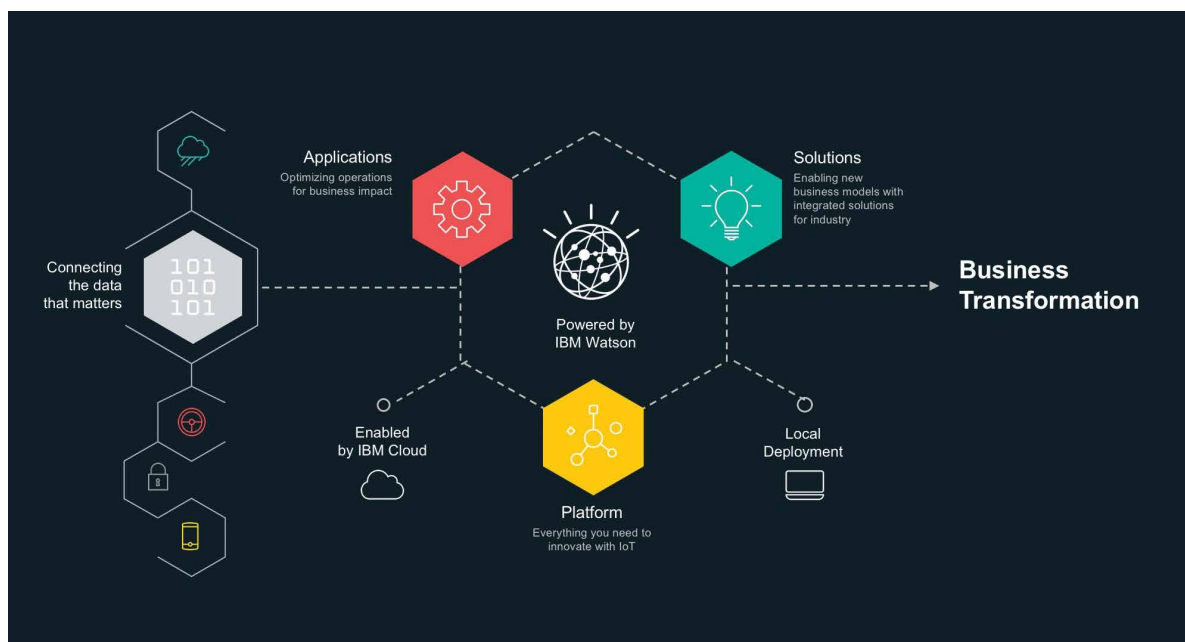
Since its founding in 1924, Daimler has become one of the world's premier automotive manufacturers, producing highly recognizable brands such Mercedes, Maybach, Smart and Freightliner. Not satisfied with only using IoT technologies to revolutionize internal operations, Daimler turned to IBM to help launch car2go, an on-demand fleet of eco-friendly Smart cars that users can reserve through a mobile app. Car2go represents a bold reimagining of the automaker's role in the broader transportation industry, and none of what it does would have been possible without the IoT.

Sensors and wireless communications allow the company to monitor individual vehicle performance, analyze data to increase efficiency, and provide an accessible network of vehicles to its customers. An intuitive mobile app allows members to take any of the car2go vehicles distributed around them, or reserve a vehicle for future use. This provides customers with easy access to a vehicle when they need it, without requiring them to purchase a vehicle or pay for a parking spot, which can be very expensive in the large cities car2go serves.

Daimler's use of IoT technology allows creative collaboration with adjacent industries. For example, user-specific data makes it possible to offer insurance policies customized for the user and trip, instead of traditional policies based on aggregate data for all users. IBM has provided the technological expertise and tools, as well as fostered the cross-industry relationships, necessary to make car2go a success.

**Daimler turned to IBM to help launch car2go, an on-demand fleet of eco-friendly Smart cars that users can reserve through a mobile app.**

IBM also is bringing the IoT revolution into the home-appliance sector through a partnership with Whirlpool. The partnership, originally formed in 2014, enables Whirlpool to use the IBM Watson IoT Cloud to analyze fast streaming data from appliances to quickly create meaningful insights and provide more personalized services to its customers.

Using cognitive analytics, data management, and protection, Whirlpool can better understand how consumers use appliances, fine-tune performance, optimize the supply chain and enhance service delivery.

Using the Watson IoT Cloud, Whirlpool can also tap into IBM's predictive maintenance capabilities to access multiple data sources in real time to predict any potential issues, avoiding quality and customer-satisfaction issues and reducing maintenance costs. Whirlpool is also using IBM Cloud Business Solutions to help customers make an impact in their communities, like making a small donation to Habitat for Humanity every time a load of laundry is washed.

Daimler and Whirlpool are examples of the many companies IBM is supporting through IoT-driven transformation. Both prove that the IoT has the potential to become an economic game changer, even for well-established companies.

## Ericsson Maritime ICT: Transforming the Shipping Industry with IoT Technologies

Despite the fact that ships carried an estimated 9.6 billion tons of cargo in 2013, accounting for 80 percent of global trade by volume and more than 70 percent of global trade by value, the fragmented nature of the supply chain, from production to warehouse to shore to ship, has made it difficult for producers and transporters to effectively monitor their cargo between ports.

And while shipping for centuries has connected faraway places, people and industries, the inherently isolated nature of ships at sea presents a unique set of logistical and connectivity challenges for the maritime industry as it seeks to deliver goods on time and in mint condition, and to ensure the safety and wellness of crews.

The rise of satellite communications and other IoT technologies has inspired the Swedish communications company Ericsson to tackle the dual challenges of supply-chain fragmentation and maritime-vessel isolation with one solution: the Ericsson Maritime ICT Cloud platform.

The Maritime ICT Cloud provides shipping organizations with the ability to connect on a unified platform and to link those vessels onto the same network, allowing revolutionary data sharing within the organizational ecosystem. Sensors monitor everything from vessel location and speed to the status and temperature of refrigerated cargo containers, giving shipping companies and producers real-time information on their goods.

> " When the crew has better access to communication, they exchange more operational info about the state of the vessel, adding more data to what's gathered from sensors to inform operational decision making. "

Additionally, Ericsson's system fosters unprecedented connectivity at nearly every part of the supply chain. The system not only monitors cargo and the ships that carry it, but also gives stakeholders across the industry the ability to obtain and analyze real-time data from production warehouse to final recipient.

"This is a real game changer for the shipping industry," said Douglas Watson, Ericsson's director of shipping. "By connecting the entire supply chain into a single, integrated system, we can achieve an unprecedented level of efficiency from warehouse to customer. The Maritime ICT Cloud platform also allows us to make our ships safer and less expensive through real-time data analysis of potential dangers and inefficiencies."

The Maritime ICT Cloud also connects embedded engine- and hull-monitoring systems with bridge communications in a way that reduces inefficiencies, risks and overall cost, effectively delivering an Internet provider protocol for proprietary maritime systems and providing the connectivity for those systems. With satellite technology providing sea-to-shore connectivity, stakeholders can make informed decisions to strengthen crew welfare, protect goods in transit and maximize route efficiency.

In addition to its direct impact on the maritime ecosystem, increased connectivity provides downstream benefits for employee and vessel wellness. In a recent survey, only 56 percent of crew members said they have access to instant communications when at sea. In the always-on age, shipping companies that provide reliable communications have a distinct recruiting advantage. And, according to Watson, better connectivity with their crews gives land-based operators better intelligence than they've ever had before.

"There may be no direct commercial gain to increasing crew connectivity on board," he said, "but executives tell us they get far more information back about their vessels than they ever got before establishing reliable contact with crew. When the crew has better access to communication, they exchange more operational info about the state of the vessel, adding more data to what's gathered from sensors to inform operational decision making."

# Daimler: Creating a Faster, Safer Trucking Industry

German auto manufacturer Daimler has a vision for a transportation industry where no one dies in a crash, and is utilizing IoT innovation to make vehicles — and by extension, the roads they travel on — safer and more efficient.

Daimler, which has maintained a consistent presence as one of the leading adopters of IoT technologies in its vehicles, is continuing to build on past innovations by developing a system for its trucks that allows highly assisted or driverless operations, reducing driver fatigue and increasing road safety.



In its pursuit of safer roads, Daimler has already implemented technologies such as proximity control, stop-and-go assist, emergency brake assist, lane-keeping assist and 3-D maps. Such features allow a vehicle to automatically keep a safe distance from other vehicles in a wide variety of traffic and road conditions, in addition to automatically braking if the need arises.

Daimler also has integrated improvements to its road-monitoring systems with innovations, such as a stereo camera and radar sensors, which allow for greater accuracy and improved response times.

Daimler is now working to produce a commercially available vehicle equipped with a "Highway Pilot System" that will increase road safety by relieving the driver during potentially dangerous sections of his or her route. In fact, a recent Daimler study found that highly automated driving has a positive effect on driver fitness. Daimler found that assistance from onboard technology reduced driver sleepiness by 25 percent compared with driving a conventional truck, if the driver had the possibility of engaging in other activities while the automated system pilots the vehicle. The benefits of the system aren't just limited to improved safety. Highly automated trucks will improve fuel efficiency by communicating with infrastructure and other road users, reducing traffic flow and improving fuel economy.

> " Highly automated driving has numerous advantages: more safety, more efficiency, more ecological sustainability and more relaxed driving and comfort. "

"Highly automated driving has numerous advantages: more safety, more efficiency, more ecological sustainability, and more relaxed driving and comfort," said a Daimler spokesperson. "As an innovative leader in the automotive industry, Daimler Trucks is defining new standards for future transportation needs and leading the wave of innovation toward highly automated trucks and safer highways the world over."

Not just content with a historical position of leadership, Daimler is diving headfirst into the technologies that are rapidly changing the way we live and move. By embracing the potential offered by IoT technologies and focusing on using those innovations to benefit its customers, the roads they drive on, and the other drivers on those roads, Daimler is setting an example of the transformative power of the IoT revolution, an example from which companies in every industry could learn.

# John Deere: Connecting the Farm to the Cloud

While its reputation is rooted in heavy machinery, John Deere has embraced technological innovations and is today playing a substantial role in bringing farming into the IoT age. The company's distinct green-and-yellow farm equipment has been an integral part of American agriculture for nearly 180 years.

Agriculture has not traditionally been a highly connected industry. Producers have been aware of what goes into the ground, and what goes out the field gate, but data on what happens in between has been a blind spot, until recently.

John Deere is using the IoT to connect each of its vehicles to a mobile online platform called JDLink, which gives farmers and their dealers remote access to fleet location, utilization and diagnostic data for each machine. Its John Deere Operations Center offers comprehensive IoT solutions for farmers, including wireless data streaming of production data, mobile monitoring, and weather and crop reporting in real time.

Networked sensors and both historical and real-time data on weather, soil conditions and crop status help farmers enhance the value of their operations by ensuring equipment is operating reliably. They optimize each job by ensuring that crops are planted and harvested when and how they will produce the best yields, and achieving what John Deere calls "agronomic optimization" by engaging the trusted partners of the farmer to analyze data and recommend changes for future crop years.

"By and large, the decisions farmers make are the result of the mental heuristic they have, the computer that sits between their ears," said Patrick Pinkston, vice president, information solutions in the agriculture and turf division at John Deere. "Producers get an opportunity to grow a crop 40 times on average, and every time, in most cases, they're betting the entire operation on their past experiences. Farmers today are under significant pressure to produce more with less, all while managing greater operational complexity. We want to try and bring more insight into it by enabling better agronomic decisions, better machine performance and better job performance."

Though John Deere's connected machines help farmers increase efficiency and get more out of their operation, the company's vision for connected agriculture extends well beyond the individual farm. Ultimately, John Deere aims to transform the agriculture industry by using data to foster collaboration between farmers and others in dispersed sectors, including suppliers who provide seeds, fertilizers and other materials to equipment manufacturers to retailers and other agronomic specialists.

> John Deere has embraced technological innovations and is today playing a substantial role in bringing farming into the IoT age.

With real-time data transfer and remote visualization, trusted advisers can be involved in up-to-the-minute decision making without being physically present at the farm site. For John Deere customers that utilize this connection, it means their dealer can remotely diagnose a machine malfunction, reducing downtime and maintenance costs. Growers can connect with retailers and buyers in real time to manage supply and product transportation.

That's not to say what John Deere is doing is easy. Companies in different sectors of the agriculture industry aren't used to working together. In many cases, they see each other as rivals or view cross-industry partnerships as competitive threats. But neither cultural nor technological challenges are stopping John Deere.

"We see our efforts to bring IoT to agriculture as a natural extension of the kinds of things we've been doing for 178 years," Pinkston said. "Our goal is the same as it has always been: helping producers be more efficient and effective, and ensuring they're more profitable."

# Silverstein Properties: Bringing Real Estate into the 21st Century

When Hurricane Sandy struck the East Coast of the United States in 2012, it left a path of destruction affecting 24 states and causing more than $71 billion in damage. The storm did some of its worst damage in New Jersey and New York, where flooding in New York City's streets and subway tunnel lines knocked out power in and around the city for days.

As one of the city's most prominent property development and management companies, Silverstein Properties felt the weight of Hurricane Sandy perhaps more than most. The company used the disaster as an opportunity to move forward, implementing a combination of mobile and digital IoT technologies that have improved everything from tenant safety through better communications tools to stronger building integrity through advanced monitoring and informed decision making.
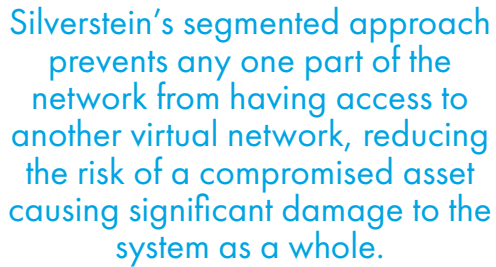


One of Silverstein's most forward-thinking innovations is in its recognition that personal technology is driving consumer and business expectations. To that end, Silverstein has deployed a mobile application that allows tenants to place and monitor work orders and requests, in addition to tracking the exact location of a shuttle bus specific to their residential buildings. It also serves an emergency-alert system, giving Silverstein a direct line of communication, via text messages, emails and automated voice calls, with tenants, residents, vendors and partners in the event of another catastrophic event.

Perhaps its most innovative and comprehensive solution, Silverstein has created a centralized monitoring system for many of its buildings, including 4 World Trade Center. "We're on the forefront of secure, safe, and effective IoT innovation in real estate," said Bill Dacunto, executive vice president at Silverstein Properties. Building management systems are much smarter, with every device networked to provide continual feedback. "When building managers get information in real time they can immediately address whatever needs to be fixed," he added.

By analyzing utility usage and incorporating efficient energy cells during peak hours to supplement supply, Silverstein has also been able to reduce energy costs for its buildings. The company is working closely with Cisco to develop a smart Power over Ethernet (PoE) lighting system. Not only will this system significantly reduce energy usage, its LED fixtures will provide enhanced lighting controls to complement the time of day or highlight a special occasion.

No connected system exists in a vacuum, but Silverstein has taken extraordinary measures to mitigate the security risks inherent in connecting building devices and systems to the Internet, perhaps more so than most early implementers of IoT technologies. Silverstein's segmented approach prevents any one part of the network from having access to another virtual network, reducing the risk of a compromised asset causing significant damage to the system as a whole.

"We're taking strides toward safer, better connected and more environmentally conscious buildings, and we're seeing immediate dividends for ourselves and our tenants," said Sandy Jacolow, chief information officer at Silverstein Properties.

Silverstein's segmented approach prevents any one part of the network from having access to another virtual network, reducing the risk of a compromised asset causing significant damage to the system as a whole.

Though real estate management wouldn't be at the top of most people's lists of industries leading IoT implementation, Silverstein Properties is one company on the cutting edge of innovative practices. It is bringing disruptive technologies into nearly every aspect of its building and tenant management systems and leading the way on implementing technologies that create smarter, more efficient buildings, and happier tenants and residents.

# U.S. Bank: Transforming the Banking Industry with IoT

From the ATM to the rise of online, branchless banking, the financial industry has long been at the forefront of new technologies that make banking more convenient and more secure. This remains true in the age of mobile technology and the IoT.

As part of its own long history of innovation, U.S. Bank was one of the first to test contactless payment technology and was a leader in implementing photo banking services, such as mobile check deposits, mobile photo bill pay, mobile credit card balance transfer and person-to-person payments.
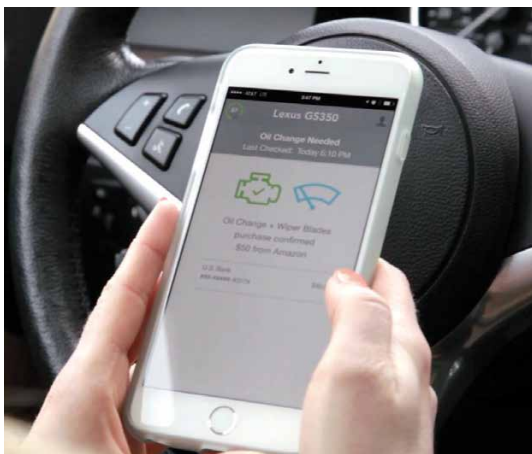
But while public perception is that IoT innovations in banking will mostly improve bank operations — from tellerless bank branches to embedded payment cards — U.S. Bank is taking its involvement in the IoT a step further. Through an innovative research and development effort, U.S. Bank is finding ways to bring financial security, convenience and value to the wider IoT industry.

Longtime players and startups alike need to be able to uncover the financial opportunities of their innovative products and services, and then to take steps to realize that potential in ways that meet consumers' expectations for convenience, security and privacy, as well as comply with a regulatory environment that is continually evolving. That's where U.S. Bank and its innovation lab — which researches, designs, prototypes and pilots new products and services — come in.

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The lab's recent prototypes include a host of devices that wouldn't traditionally fit into a financial services portfolio, but now do because of how the IoT is breaking down barriers between industries and creating greater collaboration. U.S. Bank's innovation team is looking at the "what ifs" of the IoT. For example, Withings scales could connect weight-loss goals to financial rewards — meet your goal, credit your account.

Another example: What if a device could provide real-time visual notifications of bank account debits and credits? Imagine a stoplight — red, yellow or green — if you're at or nearing a low balance, the light turns yellow; if you dip negative, it turns red.

A promising automotive idea that the innovation team is interested in is connected car devices such as "Automatic," which tracks mileage and safety data. It can automatically arrange an oil change service, if it is linked to the driver's financial account. As driverless cars continue to evolve, embedded financial capabilities will become increasingly relevant. Imagine a driverless car that can take itself in for maintenance or for a fill-up at the gas station, without needing the driver present to swipe a credit card. U.S. Bank is at the forefront of understanding, imagining and potentially developing the technologies and security standards that will make it possible.

"We're looking to improve the consumer experience," said Todder Moning, product innovation director at U.S. Bank. "We've been amazed by the sheer ingenuity of some devices we've seen and the ability some of them have to dramatically improve people's lives."

Ultimately, U.S. Bank is working to ensure that it continues to play a significant role as connected devices saturate every aspect of our daily lives, by providing seamless automation and secure, private and safe interaction between financial accounts and IoT devices.

# Amec Foster Wheeler: A Safer Way to Fuel the World's Energy Needs

More than 100 years ago, the RMS Titanic struck an iceberg and sank while sailing near the Grand Banks of Newfoundland in the North Atlantic Ocean. Today, this harsh marine environment, characterized by massive icebergs, severe wind and wave conditions, subzero temperatures and extreme fog, is home to a vast reserve of oil that the energy industry is tapping. Safety is paramount in these conditions, as oil-drilling rigs must contend with the risk of damage or catastrophic loss from iceberg collisions or major wave movement as high as 40 to 60 feet.

While the weather forecasting industry has long been at the forefront of the IoT innovation, Amec Foster Wheeler is leading the charge by pioneering safety and environmental monitoring systems for oil and gas companies in harsh environments. Amec Foster Wheeler's ability to capture continuous streams of diverse meteorological and oceanographic data in real time, and turn that into information on asset movements and logistics planning, helps energy companies increase efficiency, improve safety and substantially lower risk.

"In the past, information on potentially dangerous atmospheric conditions and threats were difficult to obtain and use for effective forecasting," said Shawn Allan, project manager at Amec Foster Wheeler. "There was no easy way for us to get timely data back to shore and into our hands, and then use that to create well calibrated forecasts of things, such as vessel motion. This data allows us to craft better forecasts for clients to make critical decisions — like when to shut down drilling, halt helicopter flights or alter a ship's course. With our integrated IoT system, we can now analyze a vast amount of current and past data in real time to allow our clients to make informed decisions that are saving lives and money, and reducing the risk of environmental accidents."

Amec Foster Wheeler's deployment of, and access, to multiple networks of sensors continuously measure atmospheric conditions and track the movement of oil platforms, icebergs and vessels. This sensory data is integrated with weather data collected from nearby ocean buoys, instruments and radar on ships, as well as data from satellites and aircraft that are looking for icebergs. In some cases, sensors can be attached to balloons that are tethered to vessels to collect additional nearby atmospheric data. The rapid integration and modeling of multiple data sources provide operators with unique and powerful forecasting tools. This extensive, real-time monitoring enables companies to base platform-management decisions on accurate, specific data, thereby increasing rig uptime and safety for workers and rig assets.

" There was no easy way to get timely data needed to make critical decisions — like when to shut down pumping, evacuate nonessential personnel or alter a ship's course. "

IoT applications using sensory technology are not limited by the environment or the type of asset being monitored. For the past 12 years, Amec Foster Wheeler has also been using sensors embedded in highways to broadcast live data measurements for pavement temperature and road conditions. This information is then used to provide predictions of unsafe road travel owing to black ice, freezing rain or snow, resulting in better pavement forecasts, increased safety, efficient use of winter-operation resources and increased savings.

The IoT is changing how businesses operate and manage risk in challenging environments by providing innovative solutions to support decision making. The use of sensory technology and rapid access to multiple data sources enables businesses to make informed decisions that save lives and money, and that reduce the risk of environmental accidents.

## Human Condition Safety: Using Sensors to Improve Worker Safety

According to the Occupational Health and Safety Administration (OSHA), more than 20 percent of worker fatalities in 2014 occurred in the construction industry. The "fatal four" — falls, electrocutions, strikes by objects and being caught in or between objects—were responsible for nearly 60 percent of construction worker deaths.[9]

Because of risks inherent on construction and other work sites, where employees interact with large, often dangerous machinery and where weather can be a wild card, sites can often feel like a battle between safety managers and workers. In 2016, AIG made a strategic investment in Human Condition Safety (HCS), a start-up company that uses the IoT to help create a safer environment for workers by identifying and reducing job-site risks.

HCS has adapted wearable technology originally developed for high-performance sports applications to reduce or eliminate many of the risks commonly associated with industries such as energy, manufacturing, warehouse and distribution, and large-scale construction, among others.

Adaptable to almost any high-risk sector, the technology has real-time and long-term planning applications for workers, site managers, and even architects and engineers. On a construction site, if a worker wearing HCS sensors enters a "danger zone" — such as the blind spot around a piece of heavy machinery — the system can warn the worker to move to a safer location or automatically shut down the machine.

Site managers can access site-specific atmospheric data to determine when to suspend work when severe weather is approaching. Architects, engineers and others in upstream planning roles can use longitudinal data to make designs safer from the outset.

Speaking of the metadata that the HCS product suite collects, CEO Peter Raymond said, "If you know the past, and you understand the present, then you can predict the future." That's the company's vision for work-site safety, and Human Condition Safety's tools are a big, important step in that direction. Construction and other key sectors will always contain some element of risk, but by learning from employees, machines and the buildings themselves, HCS is helping companies mitigate many of the biggest risks.

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# ABB Group: Predictive Maintenance for Heavy Industry

As a global leader in power and automation technologies, Switzerland-based ABB Group has installed a wide variety of power and automation equipment around the globe, ranging from motors, drives, robots and control systems to transformers, high-voltage and medium-voltage breakers, and low-voltage equipment. Connecting these devices and systems to communicate and perform the tasks required to keep its customers safe and operational is at the core of ABB's business.

Among the devices mentioned, ABB's robots have become an essential part of the global economy, increasing efficiency and safety across a wide array of industries. But the broad deployment of automation technologies has created challenges in monitoring and maintenance. ABB's customers need to know that their machines are operating efficiently, along with minimizing downtime when repairs or upgrades are needed.

ABB has been able to address these challenges through innovative IoT technologies, which are used to monitor more than 5,000 devices in the field in real time. Historically, ABB had to send technicians to perform device diagnoses in person. Now, ABB offers several cloud-based IoT solutions, including data aggregation, statistical analysis and remote control rooms that provide real-time monitoring of individual machines as well as longitudinal analytics that allow for accurate predictive maintenance. This proactive monitoring allows ABB and its clients to save on maintenance costs by reducing the time and effort required for upkeep, and to reduce costs associated with unexpected downtime by fixing machines before they break.

There is some debate about whether in-machine (or on-site) or cloud-based monitoring and analysis are more effective. Rather than throwing everything into the cloud simply because it's a newer application, ABB implements monitoring systems balancing these requirements, resulting in an approach capable of incorporating either or both longitudinal, cloud-based solutions and real-time localized monitoring to provide a comprehensive and effective service, depending on each client's need.

ABB's gearless mill drives (GMDs) are just one example of remote monitoring at work. A powerful innovation in the mining industry on their own, GMDs provide a substantially more efficient means of grinding ore into smaller particles that are more easily processed. While these machines typically operate smoothly, grinding is an intensive process that puts extreme wear and tear on the machine. Failure can delay operations by days or weeks, resulting in substantial losses for the mining operation.

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With real-time GMD monitoring, ABB is able to alert customers in time, allowing maintenance workers time to proactively address any problems with the machine and prevent unplanned outages. In one such case, ABB was able to recommend a simple, 30-minute stoppage to replace clogged air filters, saving the client a significant amount of money just by avoiding unplanned downtime.

The deeper knowledge of its own machines and how they work has also enabled ABB to add value for its clients by bringing increased efficiency to related operations. In the marine industry, ABB provides electrical components for hybrid-diesel engines. Though its work is focused on the electrical element of the hybrid engines, ABB's data collection and analysis have empowered customers to improve diesel operations and avoid costly diversions to conduct repairs, saving time and money.

"We originally started by monitoring electrical machines in hybrid systems, but as a result of that monitoring, we started to find room for improvement in engine efficiency," said Christopher Ganz, group service R&D manager at ABB. "Once we started looking at these engines as a four-generator power plant, we started to ask customers if they would like to see optimization." As a result, ABB now monitors ships around the world, helping them increase fuel efficiency in real time.

ABB's willingness to adjust toward new strategies and services can provide a great model for other companies looking for ways to improve their own IoT innovations.

# Microsoft: Transforming Industries with an End-to-End IoT Solution

Microsoft is equipping its customers with insights at every point of the supply chain, predicting problems before they happen, saving valuable resources and improving business operations around the globe.

One of the most innovative IoT solutions offered by Microsoft is the Azure IoT Suite, which provides preconfigured solutions for businesses to provide actionable insights and real-time intelligence from the devices, assets and data they already have. Azure IoT Suite also enables businesses, whether large or small, to leverage powerful applications such as remote monitoring, asset management and predictive maintenance to manage millions of connected devices and assets on any scale.

"At the most basic level, a business's IoT journey starts with identifying the one process, product line or location that matters the most, then making small changes to create value and maximize efficiencies," said a Microsoft spokesperson. "We partner with our customers to identify those factors, quickly implement innovative IoT solutions, and realize unique value and efficiency."
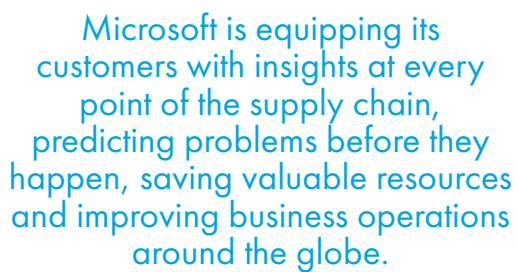
Microsoft customers, including global elevator provider thyssenkrupp, are already seeing success. Thyssenkrupp is using Azure IoT technology to connect thousands of elevator sensors and systems to create a unique competitive advantage as they monitor everything from motor temperature and shaft alignment to cab speed and door functioning.

Microsoft Azure IoT technology analyzes all of the data from the sensors and systems to provide technicians with real-time diagnostic capabilities and rich data visualization. Thyssenkrupp also benefits from Azure's machine-learning capabilities, which allow technicians to use predictive modeling to prevent errors or delays before they happen.

Another company successfully leveraging the power of IoT is energy company Rockwell Automation. Traditionally, the oil-and-gas production supply chain hasn't been inexpensive by any measure. It often requires large and expensive equipment, and breakdowns can result in costly repairs and production losses.

Microsoft has been working with Rockwell Automation to provide Azure IoT technology bringing together a broad spectrum of software, sensors and devices to predict equipment failures along the supply chain, track performance in real time, and help refine equipment designs and processes. As a result, Rockwell Automation has been able to significantly reduce downtime and maintenance, and increase productivity.

> Microsoft is equipping its customers with insights at every point of the supply chain, predicting problems before they happen, saving valuable resources and improving business operations around the globe.

## OTOY: Virtual Reality Takes Visualization to Simulation

Largely, the IoT is all about the insightful use of big data. Some sensors transmit data that can be analyzed for trends or used to spot inefficiencies. Human or artificially intelligent decision makers can act upon that information to improve operations.

Complicated algorithms written into computer software drive much of this analysis, and when we think about visualizing that data, we tend to think of spreadsheets or graphs that organize the data and illustrate trends and other findings. But California-based OTOY is approaching data visualization in a much different way, using virtual reality technology not just to visualize data, but to accurately simulate how products, buildings and other objects perform under different conditions.

For this relationship to reach its full potential, OTOY believes it must take advantage of the broad, rich data sets provided by increasingly universal sensors. "Those data sets will allow users to provide detailed and realistic virtual demonstrations of object-use cases and functionality, and then interact with the design," said Jules Urbach, founder and CEO of OTOY. While this kind of technology has only been made possible in the past few years, the experiences and tools OTOY is able to provide are incredibly compelling.
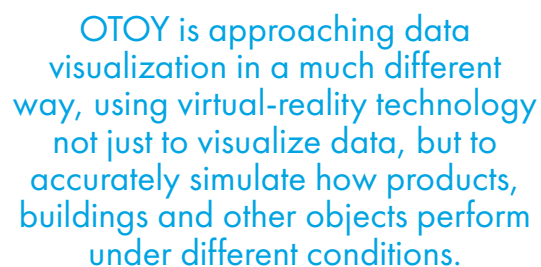
One potential use case for OTOY's technology is in architecture and construction. OTOY can use IoT-connected sensors to collect accurate, real-time data on atmospheric conditions including lighting, wind and temperature, and combine that data with inputs about various materials that could be used in a project to simulate real-world performance under conditions likely to occur at the building site.

Rather than creating a written report, OTOY can instead create a digital model and conduct realistic simulations capable of informing decision making on everything from what window material will provide the best energy efficiency to what methods and materials will maximize flood protection.

While the practical applications for the IoT in the virtual-reality realm may be a few years from the mainstream, OTOY's efforts are a great example of the potentially far-reaching implications of IoT development.

Virtual reality used to be a thing of science fiction, limited to movies and novels set hundreds of years in the future, but recent developments are bringing science fiction to real life with virtual and augmented reality applications that create an immersive experience for consumer and commercial applications.

OTOY is approaching data visualization in a much different way, using virtual-reality technology not just to visualize data, but to accurately simulate how products, buildings and other objects perform under different conditions.

# Conclusion

## A Brighter, More Connected Future Through IoT Innovation

The IoT will transform the world in which we live. As it enables businesses to improve efficiency, safety and profitability, it will usher in a new era of economic productivity and development.

This transformation is taking shape in two important ways, each of which can provide valuable insights: the transformation of internal operations and the transformation of whole industries. Both categories are a unique source of information about the direction of future IoT innovations, as well as the opportunities that come with increased connectivity.

Along with economic opportunity, IoT innovation brings with it new challenges and concerns that need to be taken into consideration. From cybersecurity to the ethics and liability issues that come with automation and loss of human control, companies must confront the contingencies that might arise.

This puts businesses in a unique position: how to embrace IoT innovation to maintain a sustainable business model, while at the same time accounting for new and different risks.

Over the next few years, no industry or company will go untouched by innovative technology.

For businesses and industries interested in ensuring a sustainable future for themselves, collaboration is key. So far, the IoT has inspired unprecedented cooperation and coordination. If the IoT revolution is to reach its full potential, industries and individual companies must continue to emphasize learning with and from one another to take full advantage.

Leaders must remain committed to eliminating barriers and increasing collaboration across competitive and industry lines to find solutions that will benefit all stakeholders. IoT technologies hold the promise of making the future of the world a lot brighter.

# Endnotes

1 iPhone® is a trademark of Apple Inc., registered in the U.S. and other countries. This publication is independent of and has not been authorized, sponsored, or otherwise approved by Apple Inc.

2 http://www.theverge.com/2015/3/9/8164357/apple-watch-event-700-million-iphones-sold

3 http://www.forbes.com/sites/ellenhuet/2014/12/17/uber-says-its-doing-1-million-rides-per-day-140-million-in-last-year/

4 http://money.cnn.com/2015/10/27/investing/uber-ford-gm-70-billion-valuation/

5 AIG poll

6 http://www.gartner.com/newsroom/id/3165317

7 http://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/2015-telecommunications-industry-outlook.html

8 http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm

9 https://www.osha.gov/oshstats/commonstats.html

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