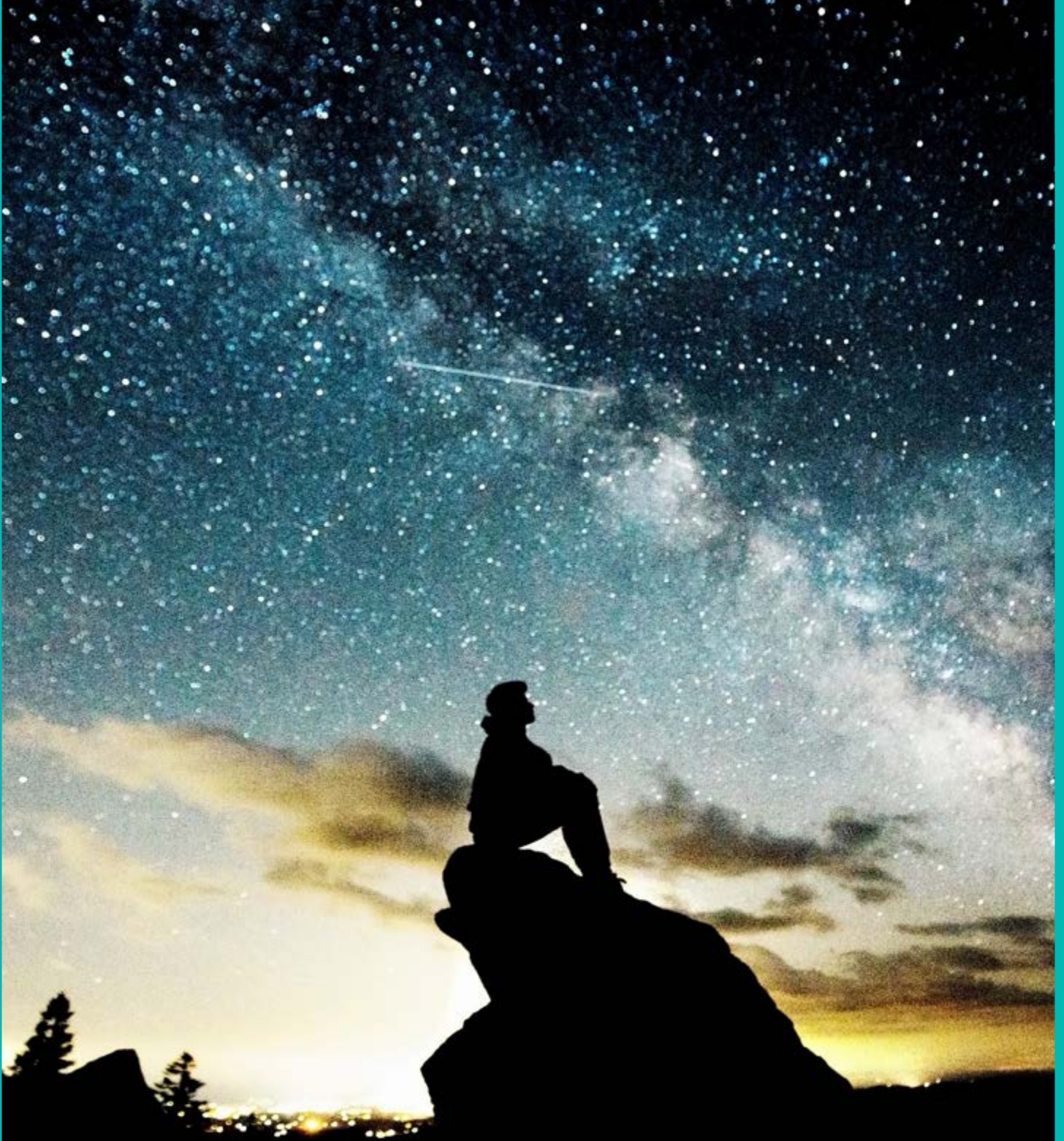


Global industry stories for the

Industrious.



Publishers:

Sharon T. Driscoll
CMO Industry Marketing & VP Sales Enablement
George Hammer
Chief Content Officer

Guest editor:

Joanne Wright

Editor-in-chief:

Michael Todd Cohen

Editorial lead:

Justine Jablonska

Editorial team:

John Kultgen
Rich McKay
Ryan Sedmak
Jordan Teicher
Marshall Wright

Guest contributors:

Sarah Dudley
Christie Schneider

Design:

Sebastian Huynh

Digital:

Catalina Bradatan
Bogdan Niculi

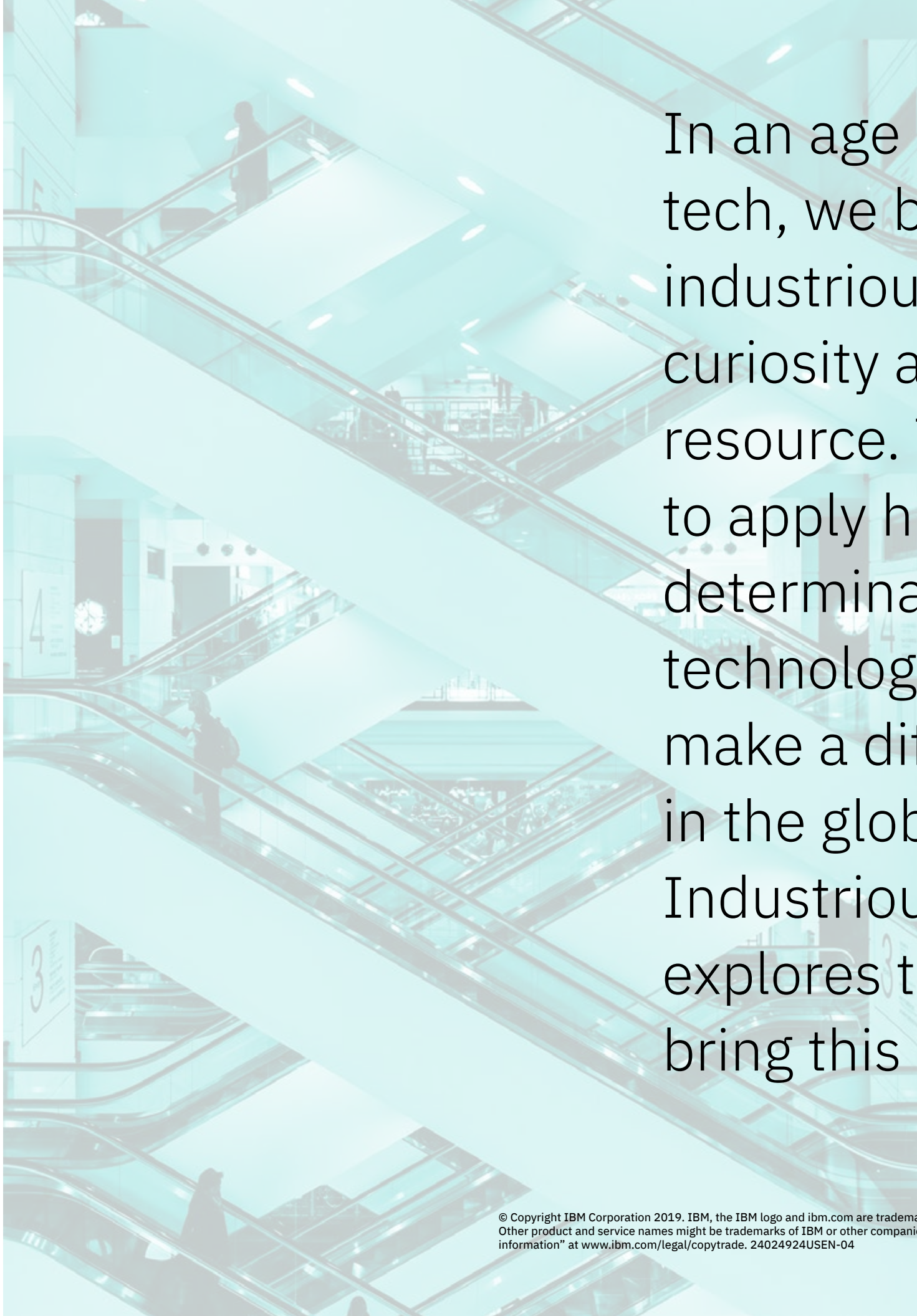
Social media:

Claudia Maseo
Arzi Rachman

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edstaff@us.ibm.com



In an age of exponential tech, we believe the industrious among us treat curiosity as a renewable resource. They are called to apply human determination and technological innovation to make a difference in the global community. Industrious Magazine explores the stories that bring this credo to life.

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A portrait of Sharon T. Driscoll, a woman with long, wavy, light-colored hair, smiling. She is wearing a dark top and a multi-strand pearl necklace. The background is a solid light blue color.

Sharon T. Driscoll

CMO Industry Marketing &
VP Sales Enablement, IBM

Terra incognita—unknown territory—was for centuries the driving force behind exploration. Curiosity gave way to discovery, discovery gave way to industry in new areas, new markets, even a “new world.”

The globe is now populated by nearly eight billion people. Industry is innovating at an exponential pace to meet demand. The focus has shifted, however, from terra incognita to terra invisibila: the invisible mass of data beneath the surface of a world hard at work.

This era of exploration is fueled by the desire to uncover, understand and leverage the vast sea of unseen data as a new form of currency. Using this currency, we can build better citizen experiences, concoct better flavors, strengthen renewable energy, and work towards ethical supply chains, among many others.

For the industrious, exploration isn't just a necessity, it's a calling.

What will you build with what you discover?

A portrait of Joanne Wright, a woman with short, dark hair, smiling. She is wearing a dark top and a necklace. The background is a solid light blue color.

Joanne Wright

VP Enterprise Operations & Services
Finance and Operations, IBM

Potential is at the heart of exploration.

We explore because we know there is more to the world than what we currently see. There is more to our business than what has already been built.

The potential of quantum computing power is staggering. The promise of 5G and AI is impressive. The opportunity to do more, faster and better, is truly exciting. To capitalize on these developments, we must be willing to risk something for the reward.

What are you willing to risk on your journey of transformation?

Your current business model?

Your comfort zone?

This issue leans into stories that look beyond our nearest horizon—to what could be with the right mix of courage, determination and know-how.

It's a world view for the industrious, like you.

“Quantum computers
have the potential to solve
intractable problems.”

Quantum computing: a conversation

by Justine Jablonska
Heike Riel
IBM Nanotechnologist



Nanotechnologists work on the nanoscale, between 1-100 nanometers. For context, an inch holds ~25,400,000 nanometers.

As an IBM Fellow and Department Head of Science & Technology at IBM Research, Riel works on advancing the frontiers of information technology through the physical sciences. She is responsible for a research agenda that aims to create scientific and technological breakthroughs in the physics of AI, quantum computing and technologies, nanoscience and nanotechnology, precision diagnostics and smart system integration.

Riel's research has advanced organic light-emitting devices display technology, molecular electronics, and semiconductor nanoscale materials and devices. Most recently, she is focused on compound semiconductor nanowires for quantum information processing.

She holds more than 50 patents, has authored more than 140 peer-reviewed publications, and is the recipient of numerous awards for her scientific and technical accomplishments.

IBM Quantum computing scientists Hanhee Paik and Sarah Sheldon examine the hardware inside an open dilution fridge at the IBM TJ Watson Research Center in Yorktown, NY.

Nanotechnologist Heike Riel focuses on the little things. The really, really, really little things, namely the atoms and molecules that make up every single thing on Earth.

Riel spoke to Industrious from Zurich, Switzerland.

How do you introduce yourself and explain what you do to non-nanotechnologists?

I say, Hello I'm Heike. I work for IBM Research, where we are exploring and developing the future of computing, and how to bring increased computing power to users.

Today, you can already do amazing things with your mobile phone thanks to the work of many physicists and engineers who worked to miniaturize the devices, increase their performance and lower the power consumption. As a matter of fact, we're able to have this conversation right now over video thanks to nanotechnology.

Miniaturization has served our needs for many years—since the 1960s, 1970s. It's now getting more and more difficult to make things smaller. Transistors are so tiny, with critical dimensions of around 10 nanometers, that we have a hard time making them even smaller and getting more performance out of them.

You work with the tiniest of atoms. What's the next big thing you're working on?

Quantum computing. It's a completely different technology than we're used to, because it applies the laws of quantum physics for computation.

In conventional computing, we use the classical laws of physics. We use bits; a bit can be a zero or a one. We can then represent and process the classical information in strings of zeroes and ones. We can keep

track of whether each bit is a zero or one at every point in time, and also manipulate them one by one during the calculation.

In quantum computing, we use quantum bits, or qubits. They can be a zero, or a one, or both at the same time. Furthermore, qubits can be entangled, which means they are inextricably linked to each other, and what you observe about one can be instantaneously connected to something that is observed about the other, even on opposite ends of the planet. We're working on building very powerful computers that use these strange laws of quantum physics.

Where are you in bringing quantum computers to life?

In May 2016, we launched the Quantum Experience, the first quantum computer accessible via the IBM cloud. You can go online and access our quantum processor and run quantum algorithms, some are even free.

We launched a commercial program two years ago.

Since then, we've created a community of people doing research around quantum computers. We are building a larger ecosystem, developing an entire stack from the hardware to the software and exploring possible applications.

There is lot of excitement because quantum computers have the potential to solve intractable problems. These require exponentially increasing resources with problem size and thus cannot be solved with classical computers. For example: it's easy to multiply two

numbers, even two very large numbers. But if you take a very large number and want to find its prime factor, that now becomes a difficult problem. Using the laws of quantum physics, a quantum computer can solve these types of problems much easier.

What are some possible areas of application?

Quantum chemistry, machine-learning problems, complex optimization problems are a few.

In quantum chemistry, for example, we want to calculate the properties of molecules. That is very difficult as they are governed by the laws of quantum physics. All the electrons interact with each other and influence each other's movement. It's a many-body problem that exponentially increases in complexity. Because of this exponential complexity, we cannot and will not be able to solve it with classical computers.

Using a quantum computer, we can exploit these laws very simply, and solve the equations describing molecules much easier.

What kinds of complex optimization problems are you solving with quantum?

We are exploring the application of assessing risks in the financial sector, for example the risk associated with an investment portfolio.

The current method of choice for performing risk analysis is a Monte Carlo simulation. Calculating the risk for large portfolios is often an overnight task and can even extend over days.



The new quantum algorithms can provide a quadratic speedup compared with Monte Carlo simulations and may reduce calculation time from overnight to near-real time or go from taking days to hours.

It will still take a few years until the hardware to realize this speed-up becomes available at the required scale, but the potential impact will be enormous.

Machine learning is another area for quantum computing. We've recently proved that quantum can help here too.

Did you ever imagine yourself doing the work you now do?

I loved math from first grade on. It was a self-acceleration process: I liked it, I kept liking it more and more. But at that time, I did not imagine that I would become a scientist.

I did a furniture-making apprenticeship. One of my ideas was to become an interiors architect.

I went back to school and followed my passion for math. I like the logical thinking and applying it to solve difficult problems.

When did you fall in love with physics?

I saw physics as the ideal subject because I wanted to understand how things work. In physics you apply math to

get that understanding.

I really like that you can apply logical thinking and explore new phenomena and understand the world around you. With this understanding you can then build new things that are not yet there and explore new paths. And you can apply physics in a way that is very practical.

When I started working at IBM, I was working on organic light-emitting devices (OLEDs). The physical mechanisms weren't understood, and it was unclear how to build an efficient OLED. To explore all this was very exciting. I saw the pieces come together, I learned more, I understood more, I could invent new

device architectures and improve the OLED performance. And then at a certain point we were able to demonstrate a 20-inch (at that time the largest) full-color OLED display with excellent properties: color, efficiency, lifetime, viewing angle, contrast.

Fifteen years later, these OLED displays are in everyone's mobile phones and even TV sets.

What do you see as technology's biggest promise?

That's a big question. I see many big technologies coming together: AI, big data

analytics, and continuous increases in computing power.

AI will lead to a complete paradigm shift. We've seen rapid progress over the last years: super-human capabilities achieved in specific applications like speech and image recognition.

Training and creating the AI models needs a lot of data

The IBM Q Lab at the TJ Watson Research Center, NY where IBM is building commercially available universal quantum computing systems.

and lots of computing power.

The data in our world is increasing exponentially, comprising data from sensors, devices, images, videos, multimedia. A lot of data is created on the internet, and the growing IoT is creating even more. And based on the data, AI models can be improved further.

None of this would be possible without the continuously increasing computing power and storage capability that we've been able to provide over the past 60 years. These trends—increased computing power, reduced cost—combined with big data and new algorithms and deep learning, all of this

is coming together to build new breakthrough technologies. It's very exciting to be part of this paradigm change and see the tremendous opportunities we now have for revolutionizing applications. This can lead to fundamental changes in many industries.

To further boost the speed of AI applications we are developing new hardware for AI. This is very exciting because we are employing completely new concepts to speed up deep learning applications. Today we use graphics processing units (GPUs) but they are not ideal; they still need a lot of energy for computation. To overcome current machine-learning

limitations, we apply approaches that include approximate computing and in-memory computing through analog AI cores.

The impact of using these new technologies will be enormous.

The hardware we develop will give us more power in the future and enable things that we are just starting to believe may be possible.

A dash of flavor, a pinch of pepper, and a spoonful of AI

by Justine Jablonska

“I’ve been at IBM for 20 years and worked on a lot of interesting things,” Richard Goodwin told *Industrious* from his Yorktown Heights office. “The coolest thing so far is this project.”

A principal researcher with a PhD in artificial intelligence who once worked on a mobile robot project funded by NASA in grad school, today he’s focused on the convergence of AI and creativity in a new arena: flavor.

By his own account, it’s a challenging domain, because the science of how humans experience flavor is not well understood.

Computers can’t taste or smell, but they can work with humans to apply data and insights to flavor creation for food products—which is exactly what Dr. Goodwin and his team have done with global flavor company McCormick.

Dr. Hamed Faridi has served as McCormick & Co.’s Chief Science Officer for more than two decades. He leads a global lab of 500 scientists and developers who work on a broad range of products; clients include both consumers and manufacturers.

A few years back, he was looking for a technology partner. “When you look at 500 scientists and developers, they have different levels of skill sets and backgrounds,” he said. “One of my first objectives was: what if I could make each of those 500 as good as the best one?”

Dr. Faridi also wanted to tap the collective wisdom of the 500 and make it available to all. Finally, he wanted the process of product development to be faster and better.

IBM and McCormick’s collaboration was officially announced this February. Combining IBM Research’s AI expertise with McCormick’s deep sensory science and taste data (including decades of past product formulas and millions of data points on consumer taste preferences and palettes), its first AI-enabled platform ONE launches later this year.

“Creating food products is much more challenging than just creating a recipe at home,” Goodwin said. Amounts need to be exact, as do the ingredients.

For example: more than 400 types of garlic exist, and every kind of variation—from country of origin to powdered grain size—can make a difference. Finding the right one can be a challenge.

“You may want multiple garlics,” he said. “One for taste, one for appearance. Maybe even different sizes. One type may hit your tongue quickly, another will give you the back flavor. It’s a very complex task.”

Flavorists and product developers have created hundreds of thousands of formulas across the decades. For a human to read through them all is a near impossibility—but not for a computer. That’s where AI comes in, searching for patterns that led to previous flavor success, and suggesting different flavor combinations that a human may not.

“People have their own style,” Goodwin said. “What they’ve been successful with in the past tends to be what they lean on in the future.”

Computers don’t have that same bias.

“If I’m a developer, I may already have a favorite flavor,” Faridi said. “If I’m developing a pizza seasoning, I’m thinking Italian, Mediterranean flavors. I wouldn’t think about adding cumin.”

But the system just might.

“The system makes a proposal and sometimes it doesn’t work. But sometimes it does,” Faridi said.

And since the system is a learning machine, it incorporates feedback from developers into its next proposals.

We can learn five things from the system data, according to Goodwin: pairings of flavors; functional substitutes; a definition of what it means to be a particular product (barbecue sauce vs. marinade); flavor space (a sweet dessert shouldn’t get a yellow onion); and how to predict success based on various factors.

Speed, too, is of the essence, and where the technology can help. A significant portion of product development in the flavor solution world is responding to competitive requests. Being first to respond with an innovative product or flavor is a strong competitive advantage, Goodwin said.

Faridi agrees.

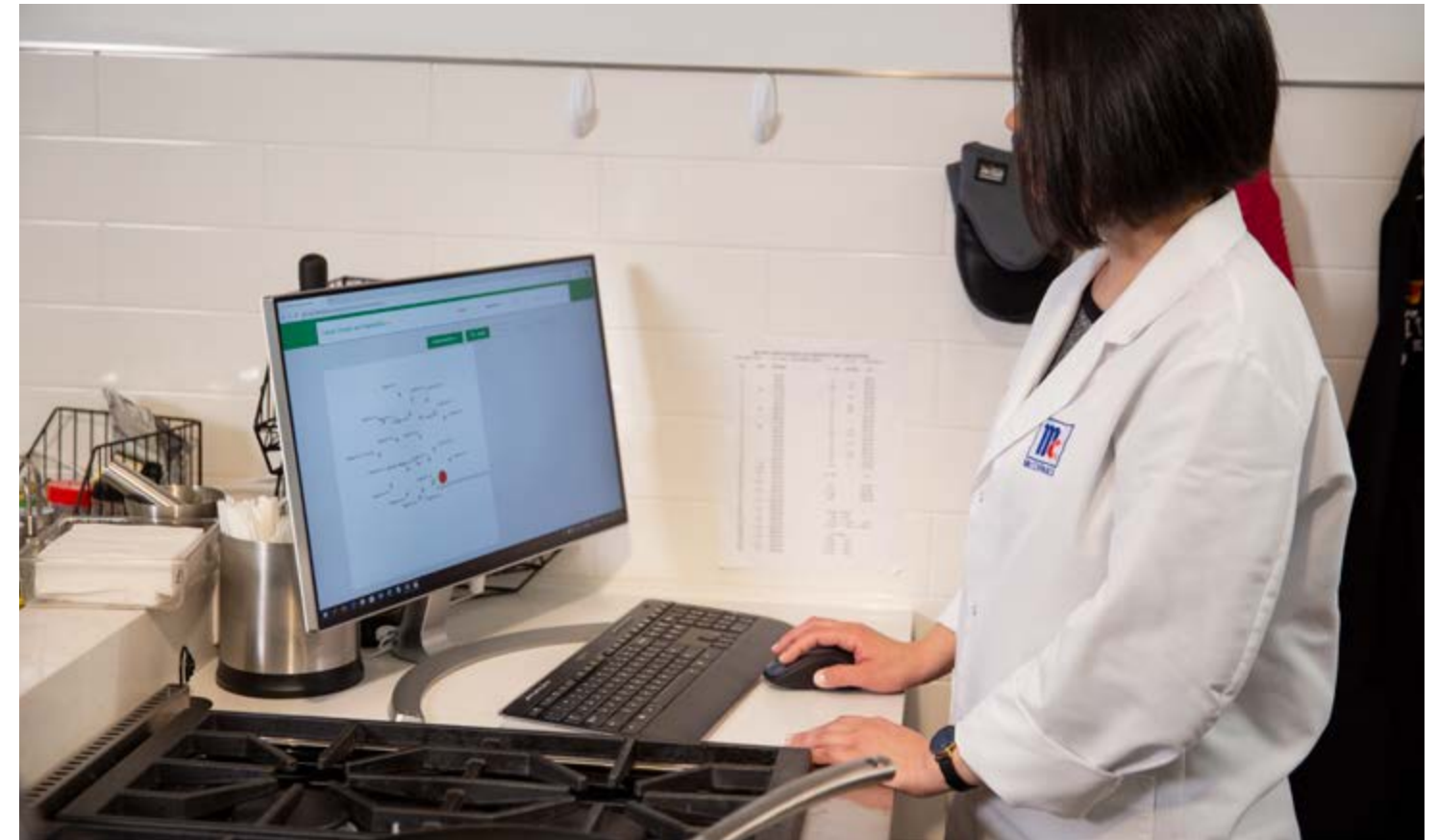
“One of the challenges people at my level have is how to help companies develop products that have greater staying power in the market,” Faridi said. Some products may stick around for just a few years, while others—like Oreos, introduced in 1912—have obvious staying power.

“Finding the next Oreo can be like finding a needle in a haystack,” Faridi says. “Finding a formula with very broad appeal is a challenge.”

He hopes this new platform can help his team discover new icons.

“We want to be at the forefront of flavor,” Faridi said, which is especially important in today’s highly segmented and varied market. Plus, younger generations want to experiment, he’s found. That, combined with e-commerce, is another great fit for the new platform.

“We can rapidly screen the data, analyze it, and give new suggestions,” he said. He’s excited for the future possibilities, too: “We’ll be in the discovery phase for several years. And what we’re seeing today is just the beginning.”



A McCormick product developer uses IBM Research AI for Product Composition technology to explore flavor territories more quickly and efficiently. Photo: McCormick & Company

Can blockchain pave the way for ethical cobalt?

by Jordan Teicher

Benoit Nemery, a professor of toxicology at the Belgian university K.U. Leuven, has long been involved, together with researchers from the University of Lubumbashi, in investigating the “collateral damage” caused by mining activities in the copper-cobalt belt in the Democratic Republic of Congo.

“It’s very chaotic, very dirty, and very obviously polluted,” he said.

Since 2006, he’s visited the country—one of the world’s poorest—annually in an effort to better understand the health effects of cobalt exposure among those who live around mines and metal processing industries. But when he arrived in Kolwezi, the heart of the Congolese mining region, on a 2014 trip, the conditions were unlike anything he and his local colleagues had ever seen before.

Just a few months earlier, a man had discovered cobalt ore, or heterogenite, in the middle of Kolwezi’s working-class Kasulo neighborhood. Soon, amateur prospectors, or “creuseurs,” descended on the area with hand shovels and pickaxes and began their own small-scale “artisanal” mining operations.

“We’d seen artisanal mining in many places but never in the way we’d see in Kasulo. It was spectacular and tragic, really,” Nemery said. “I have pictures where you can see everything had been turned over. There were pits 20 meters deep, and a lot of rubble everywhere, and children playing around in it. Some people were keeping the minerals in their own homes.”

Over two brief surveys, in 2014 and 2015, Nemery and his colleagues took biological samples of dozens of cobalt workers and Kasulo residents, including many children. The results, which were published in *Nature Sustainability* in September 2018, were disturbing. Concentrations of cobalt and accompanying trace metals in the urine of those tested were, he said, “among the highest we’ve ever seen.” According to the National Institute for Occupational Safety and Health in the United States, cobalt exposure can harm the eyes, skin, heart, and lungs, and may even lead to cancer.

Officials have since cracked down on artisanal mining in Kasulo, but the practice continues throughout the country. Today, the DRC remains the world’s biggest supplier of the



metal, a crucial component in lithium-ion batteries that power a wide range of products including smartphones, laptops, and electric cars. According to a report from Morgan Stanley, cobalt demand is expected to multiply eightfold by 2026.

But while many companies source their cobalt from safer, large-scale industrial mines, there’s currently no surefire way for companies to prove that to customers, since cobalt, when smelted, is regularly combined with metals from a variety of sources.

“Everybody wants to make sure the products they’re using don’t contribute to worker violations or promote child labor. There’s an incentive for companies to prove that their products are ethically sourced,” said Max Nelson, a Global Business Development Executive for Industrial Products with IBM Global Markets.

Today, a consortium comprising Ford Motor Company, IBM, LG Chem and RCS Global is working on a way for companies to finally offer that proof to customers all the

way from point of extraction. Together, they’re working on a first of its kind pilot to demonstrate how materials in the cobalt supply chain can be responsibly produced, traded, and processed from mine to end manufacturer. The key to the program is blockchain.

“What differentiates this program is the transparency, the trust, and the security that this platform is built on,” Nelson said.

The pilot, which began in December 2018 with oversight from responsible sourcing group RCS Global, starts at an industrial mine site in the Democratic Republic of Congo. The cobalt produced there is traced through the supply chain as it travels from mine and smelter to LG Chem’s cathode and battery plant in South Korea, and finally to a Ford plant in the United States. The result is an immutable audit trail, created on the IBM Blockchain Platform and powered by the Linux Foundation’s Hyperledger Fabric, which can be seen by all permissioned network participants in real time.

“At IBM, we’re organized across 12 different industries, so we have the industry knowledge and leadership to bring this together. That’s how we’ve been successful in bringing in participants across the supply chain,” Nelson said. “We think original equipment manufacturers, aerospace and defense companies, and all these industries across the supply chain will be encouraged to join this platform upon completion of this pilot.”

While the initial focus of the program is large-scale miners, or LSMs, Nelson said the group wants to ultimately expand the initiative to include the kinds of small-scale operations Nemery visited in Kolwezi. If those miners meet internationally ratified responsibility requirements, Nelson said, the consortium stands ready to help them partner with due diligence data providers and, ultimately, join the blockchain network.

“The broader purpose of the network is to make a true positive social impact and help address the root causes of the challenges faced by the artisanal miners,” Nelson said.

When one life changes, it affects the whole community. That's the ultimate goal: a healthier community.



Learn more about how Sonoma County and IBM are working together to change lives

<http://ibm.biz/GovtSocialPrograms>

Sonoma County is empowering its caseworkers to help the most vulnerable

by Justine Jablonska

California resident Sandy Beech* was seeking a fresh start in Sonoma County when she moved from Santa Cruz in 2017. Her son, struggling with substance abuse, had become threatening towards her, and she feared for her safety. But she was unable to find affordable housing, and soon began living in her car. That exacerbated existing, chronic health problems, for which she sought treatment in an emergency room. She also experienced behavioral health issues.

“Sandy is representative of the population we’re trying to serve,” said Barbie Robinson, Sonoma County Department of Health Services Director. “She faced a number of life challenges. She was homeless, with mental and physical health challenges.”

Though Beech had received services from agencies in Santa Cruz in the past, she wasn’t able to connect with Sonoma County’s support systems. Learning about the various systems available to her—and registering for them—proved a challenge.

“We’re dealing with a population with complex needs,” Robinson said. “Individuals fall through the cracks, and we see poor outcomes and poor experiences in accessing government programs and services.”

At the time, the Sonoma County Board of Supervisors was working on a better way to address the needs of residents like Beech. Their program to strengthen the safety net system—Accessing Coordinated Care and Empowering Self-Sufficiency—was made a top priority. The county began forming multidiscipline teams (IMDTs) with the ultimate goal of holistic services for those in need.

“We started looking at the most vulnerable individuals in Sonoma County,” Robinson said. “We’d already started conversations with

IBM. We were beginning to look at data, and the wildfires hit.”

The Sonoma Complex Fires struck the county in October 2017. The fires burned 36,000 acres, destroyed thousands of buildings, mostly homes, and killed 22 people. To escape the smoke, Beech found her way into one of the many local shelters opened for those who’d lost their homes. When the shelters began closing a few weeks later, some residents were able to find places to live. But others were not, and that included Beech.

“We needed a rapid response,” said Carolyn Staats, Sonoma County IT manager. “We had to help them now. Everything had to work yesterday.”

The county worked with IBM to create a Rapid Response pilot. Powered by IBM Cloud, the solution enables—with individual permissions—data integration among agency systems. That’s crucial because government agencies are usually separately funded, with separate management and staff, facilities, budgets, and priorities. In Beech’s case, she needed services from housing, health, and many social service departments, but in the past, none of those departments had a way to see her information in any system other than their own.

The solution includes IBM Health and Human Services Connect360 with embedded Master Data Management, as well as IBM Watson Care Manager. That gives the county a 360-degree view of resident needs and status. Which, in turn, empowers the integrated multidiscipline teams to collaborate on what will truly make a difference in their clients’ lives.

“The system enables us to coordinate between case workers and substance abuse counselors and eligibility workers,” said Shirlee Zane, Sonoma County Board Supervisor. “And it can all happen rapidly, so we can get that person back on their feet again.”

Social service worker Jessica Hetherington works for the Sonoma County Health Services Behavioral Health Division. One of her challenges in the past was communication from one department to the next. To bring a resident like Beech out of homelessness meant giving her multiple levels of care in order to truly change her dynamic and empower her to be truly self-sufficient. This meant stabilizing her physical and mental health, and bridging her temporary housing needs on the way to permanent housing.

“We ended up getting Sandy permanently housed and connecting her with services there,” Hetherington said.

Beech is one of more than 90,000 residents whose profiles were part of the pilot program. Her health services mental health caseworker asked Beech whether her information could be shared across the teams during the pilot—allowing the appropriate services to be coordinated across multiple agencies.

Sonoma County and IBM are continuing to work together on identifying the county’s most vulnerable populations in order to provide them the most appropriate services. The technology is scalable, meaning it can be used as a blueprint for how other counties and states can holistically manage care for populations with complicated needs.

“We know that when one life changes, it affects the whole community,” Sonoma County Board of Supervisors’ Zane said. “And that’s really the ultimate goal: a healthier community.”

* not her real name





AI may help burn patients live longer lives

by Justine Jablonska

“We’re looking at the long-term effects of burns on the health of a person over their lifetime,” Dr. Mark Fear told *Industrious*. “Our group focuses on the impact of non-severe burn injuries, meaning smaller injuries. These make up around 90 percent of the caseload in Perth and similar cities.”

A senior research fellow with the Australia-based Fiona Wood Foundation, Dr. Fear is part of a team working on advancing research for burn patients—specifically on the link between burn injury and cancer. Professor Fiona Wood initiated the project in 2009 when an eight-year-old who’d been treated for severe burn injuries died of cancer a few years after their treatment.

“Using population data from Western Australia, and Scotland, we found that people with a burn injury are more susceptible to cancer later in their lives,” Dr. Fear said.

The team set out to understand what about a burn injury causes that susceptibility, and in

2016 brought together an immunology/cancer group, a burns group, and IBM.

IBM’s AI discovery solution, Watson for Drug Discovery, studied millions of pages of life sciences literature to extract all the genetic relationships attributed to burns and cancer.

“We were essentially looking for a needle in a haystack,” Professor Fiona Wood said. “This time we had a seriously powerful magnet in using Watson to accelerate our discovery phase of the research.”

Thus far, the team has made two important discoveries. The first is that burn injury seems to increase cancer metastasis (a medical term for cancer that spreads to a different part of the body). The second is that the burn might lead to changes in immune surveillance and control of tumors.

“We now have a way to investigate the mechanisms that link burns to cancer,” Dr. Fear said. A good model that showed that link wasn’t previously available.

“Without this, we

couldn’t ever understand what is happening—so it is a big deal for us,” he said.

Now that the team has identified that a link between burns and cancer exists, they are drilling down to define what that actual link is.

One theory is that the burn changes immune function in the long-term, but the team is not sure how. Dr. Fear underlines just how critical the three-way collaboration between IBM, immunology, and his team is as the project moves forward.

“It’s really important to bring together the different expertise,” he said, “as we can’t approach these problems with just a good knowledge of burns. We need the other knowledge and technology to make progress into areas where we cannot be experts, but which clearly impact our field.”

The team is now conducting more complex experiments that will look at relevant immune cell changes and functional changes due to burn injury. Once they know why burn

injury leads to increased susceptibility to cancer, the team can look to change treatment for acute patients, or better monitor them after discharge.

“We hope—and this is research so it takes time—that we will understand what is causing this and be able to use that to treat patients better,” he said. “And this may impact a much wider patient set too, as burns really are a subset of trauma.”

Ultimately, his goal is improved patient outcomes and lives after what are often devastating injuries (“for parents too, in particular when it’s children who are burned,” he adds).

“Bear in mind the age group most likely to get a burn is zero to four years old,” Dr. Fear said. “These kids have a lifetime ahead of them. We need to make sure their lives are as healthy as possible.”



How blockchain can make your next trip Instagram-worthy

by Rich McKay

For some, vacation means a sun-filled week swigging margaritas at the beach. For others, it means paddling through dense Guyanese rainforests in an indigenous dugout canoe, or photographing spectacular horse races in Mongolia's Golden Eagle Festival.

"New generations are no longer buying assets. They're buying experiences," said Mike Croucher, Chief Architect at travel commerce platform Travelport.

The demand for memorable moments over material goods has created what Jeff Frum of Millennial Marketing calls a form of "experiential currency." In this digital age, Gen Zers and Millennials want fun experiences they can share on social media to earn likes and inspire their friends, family, and connections.

Millennials plan to spend 35 days each year traveling, and 40 percent prioritize "Instagramability" when choosing a destination, according to travel site Skift. Gen Zers are more "bucket-list oriented and looking for off-the-beaten-path locations," and 90 percent of their travel decisions are influenced by social media.

Travelers want unique experiences they can manage with ease and simplicity. But is the travel industry ready to accommodate them?

"The supply chain within travel is often fractured," Croucher said. "It's especially challenging when you look

at in-trip tours and activities. Local cookery or language lessons, Segway tours, and gallery passes are often part of an Instagram-worthy trip, but they need to be procured from small, in-destination suppliers and paid for in local currency."

Travel commerce platforms like Travelport could enable a single-transaction booking of in-destination experiences. Managing the complexity of large numbers of small-scale suppliers, according to Croucher, has historically been a barrier.

"The cost for us to put content from smaller, local travel providers onto our system takes quite a lot of work," Croucher said. "There's the expense of surfacing it and then the expense of settlement and managing contracts."

The entire process to reach a completed transaction often takes time, he said, due to the diverse nature of travel services and products, and the limited technical capabilities of travel suppliers.

Today, travelers looking to discover small, local suppliers must sort through many untrustworthy and even false reviews. Booking flights, hotels, and other travel accommodations can be overwhelming.

That's where blockchain can make a big difference, Croucher said. In 2018, Travelport began working with IBM to explore how the distributed ledger model of a private blockchain could solve the issues of content distribution and settlement.

Thanks to blockchain, travelers, experience providers, and hotels could benefit from the management and increased availability of so-called "long tail content."

"We're putting the ability into the hands of the operator to upload bookings and work through contracts and administrative tasks within the blockchain network rather than manually managing and owning these tasks, which is normally the expensive part of transactions," Croucher said.

To ensure that the experiences available through this blockchain are trustworthy, meaning that they actually exist and are of suitable quality, Travelport will require every piece of content—every walking tour or fishing expedition—to be endorsed by a person or entity in the local market.

"A local travel agent or a tourist board would endorse the content, giving a seal of approval on the chain," said Croucher.

Once the content is endorsed, it will become visible on the blockchain to resellers, such as a hotel or cruise line, and the endorser will receive a commission on the sale of their endorsed products. When a sale takes place, a smart contract will execute an automatic payment to each participating party.

"It's an instant settlement of commission, whereas today the settlement of commission on any sale is a six to eight-week process," said Croucher.

While the value of blockchain for travel may be compelling, companies may be unsure about where to start. Croucher has

some advice for cutting through the hype of blockchain.

"It's not about applying blockchain to existing processes," he said. "It's about identifying business problems that distributed ledger capabilities can solve and then applying blockchain."

This thoughtful approach will lend itself, he said, to a successful digital transformation.

"Technologies like blockchain allow us to think differently about business and processes. No matter what industry you're in, you must disrupt yourself," he said.

Learn more about how travel and transportation businesses can apply blockchain for greater transparency

<http://ibm.biz/IndustriousMagHotel>



How IoT can keep our water clean, safe and sustainable

by Sarah Dudley

“You turn on the tap and good clean water comes out. But what if it didn’t?” Heather Himmelberger said.

Himmelberger is the director of the University of New Mexico’s Southwest Environmental Finance Center. In her 2014 TEDx Albuquerque Talk, she focused on the sustainability and future of water.

“Water is the foundation upon which everything else is built—our health, quality of life, jobs, recreation, even entertainment,” Himmelberger said. “If water infrastructure crumbles, we lose everything else with it.”

Water delivery requires a massive network of assets: from pumping stations to pipes to water treatment facilities.

“If you took the water piping that serves the Albuquerque area alone and laid it end to end,” Himmelberger said, “it would stretch all the way from here in central New Mexico to the tip of Maine.”

Each of those water piping assets needs to be tracked, monitored, serviced, repaired and replaced. Costly failures invariably happen. The American Society of Civil Engineers (ASCE) estimates that nearly two trillion gallons of treated drinking water are lost through main breaks each year in the US alone. An estimated one trillion dollars is needed to maintain and expand services over the next 25 years.

The challenge is determining the optimal maintenance and repair approach that balances risk with cost. In the past, these decisions have been scheduled based on the age of the assets, with little consideration of usage—similar to how car manufacturers recommend service every three months or 3,000 months.

But industry leaders are taking a new approach when it comes to maintenance and repair.

“You don’t need to replace it just because it’s old,” said Paul Crocker, maintenance supervisor of the Kansas City’s Board of Public Utilities Nearman Drinking Water Treatment Plant. “If it isn’t broken, in a failing state, or causing you trouble, then you don’t necessarily need to do anything about it. The truth is that failures can occur at any time and most are random in nature.”

Water utilities across the world are advancing their preventive and break-fix maintenance strategies by

Where are you on your APM journey?

<http://ibm.biz/IndustriousMagIoT>

using asset performance management (APM). APM helps asset-intensive organizations like water utilities or electricity distributors realize massive savings by avoiding unnecessary maintenance, reducing risk of failures, and improving overall resilience using IoT and AI. Results show that implementing APM can reduce failure risks by up to 95 percent while lowering costs.

APM starts with helping organizations identify their most critical assets—meaning, assets that have a significant impact on production, safety, costs or quality. A better understanding of which assets matter most helps determine the focus for the best maintenance strategy. For water utilities, knowing which pumps, pipes, hydrants and valves are critical enables them to be smarter about how they ensure those assets stay resilient. This may mean adding IoT sensors to capture asset data in real time or having spare parts on hand if those assets were to fail.

More organizations are choosing to apply analytics and AI to that information, taking in context around usage, weather, age, and historical patterns to help predict critical failures before they occur.

Smart utilities are recognizing that using IoT and AI to manage water infrastructure must be done strategically.

“You need a clear line of sight throughout your entire organization to make sustainable investment decisions,” said Marcel Morsing, co-founder of global consultancy firm MaxGrip.

“It’s not just about technology,” Morsing said. “People processes, and systems need to be aligned with the strategy.”

And with the right action plan for digital transformation, he adds, benefits can be substantial.



Nation Waste Inc.'s CEO Maria Rios sees opportunity everywhere

by Justine Jablonska

“When I see waste, I see opportunity,” Maria Rios begins. “That’s my slogan.” She’s calling from the library of her alma mater, the University of Houston, where she’s now a board member.

The university is where she wrote the business plan for her now-multimillion-dollar company Nation Waste Inc., the first female Hispanic-owned waste removal company in the US.

“I always wanted to be a business owner,” Rios says. “My parents were farmers and business owners, and I never wanted to work for anybody but myself.”

Rios came to the US from El Salvador at 13 with her parents, who were determined to escape the civil war and provide a better life—and education—for Rios and her siblings. She didn’t know a word of English upon arrival. “My job was to go to school and learn English.”

After high school and starting a family (“That could have been the end of my career, but I decided to keep moving forward”), she took classes at a community college before transferring to the University of Houston.

There, she wrote a business plan on waste management for a graduation project. She remembers thinking that trash would always be there, and somebody would always need to pick it up. Why not be innovative about waste management?

She started Nation Waste Inc. with a focus on commercial waste, then expanded into industrial, recycling and portable toilets.

Last year, Rios partnered with IBM to launch the Nation Safety Net. Powered by Watson IoT, the solution uses environmental sensors and wearable devices that identify potential dangers and help employees avoid injury.

“Safety is the most important thing for me, especially for my employees,” Rios says. “We already monitor how many steps we walk each day. This was a natural extension: why not utilize technology to help keep workers safe?”

Nation Waste Inc. is currently piloting the Nation Safety Net with select clients, and then plans to launch globally.

“I want every employee to be safe and secure,” Rios says. “I also want to make a positive impact on my community—not just for profit, but for social impact.”

That love for community is evident throughout her life and career. She volunteers with Girl Scout troops and Little League organizations, and frequently mentors young girls and women.

“I have to jump in and tell this story,” Mark Madrid, CEO of the Latino Business Action Network, chimes in.

A few years ago, he was

contacted by a group of students from Texas State University in San Marcos. Part of the Hispanic Business Students Association, they had a question for him: “Do you think it’s possible for us to meet with Maria Rios?”

Rios hosted the students on a Saturday, catering breakfast, lunch and a reception complete with a celebration cake. The students took part in a simulated boardroom meeting, and Rios walked them through a day of operations. The students learned about entrepreneurship, business operations, sales, accounting—and possibility.

“It was a glorious moment,” he says. “That experience changed some of the students’ lives.”

“It’s crucial for young people to see that they don’t have to limit themselves,” Rios explains.

Mark agrees: “It’s important specifically for young Latinos and Latinas to realize there are bona fide rock stars in spaces beyond entertainment and sports. A lot of times these students may not know about the top Latino leaders in the country beyond the very famous few we know about.”

When they hear Rios’ story, he sees the twinkle in their eyes: “It’s a confidence booster,” especially when she tells them: “If I did it, you can too.”

The fact that Rios is doing

it—and succeeding—in the waste management industry, traditionally dominated by men, is also notable.

“Her type of confidence and competitive fire, wanting to win by playing the rules certainly distinguishes her,” Mark says. “It’s amazing that a woman entrepreneur, a Latina, is saying, ‘I also can. I can operate and prosper and show the big boys how it’s done.’”

Another area of impact for Rios and where she’s leading the charge is the environment. She wants to make an impact not just in individual neighborhoods but throughout the US. To that end, she encourages her clients to perform waste analysis: What can be recycled? What can be reused?

“I want to find ways to not put anything into landfills,” she says. “I want to bring things back to life.”

Her ultimate goal is zero waste: everything gets recycled and nothing goes to landfills.

“If I can do it, anybody else can.”



IBM's Luq Niazi believes that a smarter supply chain can lead to a better planet

by Jordan Teicher



"There's a joke in IBM, which is that IBM stands for 'I've Been Moved,'" said Luq Niazi. "If you're progressing in your business area, you'll get a new responsibility every two years."

Such has been the case for Niazi, essentially, since joining the company in 2003. Fortunately, Niazi likes new challenges. In multiple roles across multiple industries at IBM, he's been driven by a sense that business challenges are human challenges, and that strong leadership at the enterprise level can benefit society as a whole.

So when he was asked to take on the role of Global Managing Director for IBM's Consumer Industry this October, he didn't think twice about his decision.

"Typically, when I've been asked to take on a big role change, I'd go check with my wife, but in this case I immediately said I'd do it," he said.

At the time, Niazi had been serving as the Global Managing Director for the Chemical & Petroleum Industries, and he felt a great deal of satisfaction working to make energy production, distribution, and utilization more efficient.

"A large part of my time and energies have gone toward making this concept of a 'smarter planet' come to life, particularly in the energy field," he said.

Retail and consumer products, he soon

determined, offered another compelling way to make that concept a reality. Today, he believes the same principles that underscored his waste-reduction work in the chemical and petroleum industries and his consumer-centricity work in the communications industry will motivate his efforts in his new role. The key, he suspects, lies in blockchain's transformative applications for industry supply chains. Ultimately, he said, the impact will be both good for the planet and good for customers seeking great experiences characterized by transparency, convenience, and personalization.

"There's a lot of waste that occurs at the end of the supply chain. Lots of food is wasted. Lots of clothes are burned," he said. "We need to be manufacturing for the demand in the supply chain and also redistributing to where the demand is needed. That means people will get what they want more often, but it also means we'll put less waste in the total supply chain."

Niazi has always been ambitious. He began his career as a project manager specializing in programs to design, build and operate air traffic control services through Scotland and Northern England. Over the years, he's developed a long track record of enacting major business and technology transformations for both multinational and

national clients.

"IBM has such a vast array of capabilities and services and technologies that there's always going to be a wide variety of what you get to experience as a professional and leader here," he said. "What I think what I've done multiple times in my career is connect my clients' industry agenda and their transformation needs to IBM's transformation capabilities."

Now, as he embarks on yet another professional adventure, Niazi is looking to keep connecting those dots. And he's eager to apply what he's learned at IBM to a whole new set of industry challenges, including transforming enterprise operations, creating AI-driven supply chains, driving digital consumer engagement, and delivering smarter customer journeys. His own personal end goal, however, remains the same.

"If you are educated and trained in a certain way and have a certain set of professional experiences, what you want to do is make an impact on society," he said.

Connect with Luq Niazi on LinkedIn

<http://ibm.biz/IndustriousMagLuq5>

Research director Bola Rotibi focuses on the people behind the technology

by Rich McKay

Bola Rotibi has a piece of advice for companies building new technology.

“You can’t expect artificial intelligence to improve your situation if you don’t use actual intelligence in its formulation,” said Rotibi, research director and founder of UK-based Creative Intellect Consulting.

That’s because focusing on how people really use and benefit from technology can frequently be an afterthought in software development projects, according to Rotibi.

“There’s a danger in thinking technology is all just bytes and code, but the whole culture around technology is what is really exciting,” she said. “The soft side of technology is often overlooked—the psychology behind it, how people interact with it and are impacted by it.”

The love of the people behind the tech led Rotibi to where she is today. Her openness to new ideas and perspectives started when she was young (“Gosh, do we really want to go that far back?”). She loved science fiction like *Star Trek* and *Star Wars*, and was also an avid reader who immersed herself in art. This balanced and open approach to life continued in her working world.

As Rotibi built an impressive career spanning

engineering, software development and IT analysis, she often noticed that developers were too siloed from the other decision-makers, especially when it came to strategy and operations. She realized that being a smart digital operator was not all about building software effectively. Just as important to success were developers’ interactions and integration with other roles like business and operations.

She decided to do something about that, and founded Creative Intellect Consulting, which embraces software development delivery and life cycle management across the software landscape.

As part of its work, the company looks at key technologies like cloud, blockchain, IoT, 5G, agile and DevOps within the context of business and operations. To be successful with transforming business, however, Rotibi recommends being outcomes-oriented rather than diving into the latest buzzworthy technology.

“For a successful digital transformation, the key thing is a long-term vision and the outcome you actually want to achieve,” Rotibi said. “When a digital transformation doesn’t

work, it’s often because a company implemented new technology but had no clue as to what it could do for its business.”

To that end, organizations need to think about new ways of operating, improving customer experience, disrupting themselves and their market, and seeing what opportunities they can grasp. And, said Rotibi, it’s about “how a business interacts better with itself and with its community. And that community might be suppliers, customers, and employees.”

A community mindset is useful because it often removes roadblocks. Conversations suddenly shift from “what can the technology do?” to “what do you want the technology to achieve?”

“Whenever you ask a company about digital transformation, the one thing they will always say is that it is so important to have the right people who are able to think beyond the boundaries and collaborate,” said Rotibi about why she insists on marrying lines of business with developers. “That’s not technology, that’s people.”

Besides being outcomes-focused and embracing the people element of digital transformation, Rotibi recommends that

organizations analyze how they can use what they already have.

“You can’t throw out the baby with the bath water,” said Rotibi. “You can leverage a lot of old technology, practices and operations even before you get to the new things.”

This “leveraging the old” approach also applies to new technologies like 5G, a technology sometimes criticized for what it can and can’t do today.

“You have to prepare yourself now to get to 5G,” she said. “It’s about leveraging the network that you have today—and you’ll be surprised at what you can achieve—because you’ll be in better shape to take advantage of what’s coming tomorrow.”

Another technology example is IoT, which is fundamentally about connectivity. What any business must do irrespective of what era they’re in—whether 2G, 3G, 4G or 5G—according to Rotibi, is ask what you get from that connectivity or can it help with your communication network. Organizations should explore the possibilities first.



“Trust, visibility
and transparency
are fundamental
for the efficient
functioning of the
market.”



Alectra Utilities is powering a renewable energy breakthrough

by Rich McKay



Vikram Singh figured his customers might respond positively to a new renewable energy pilot, but the unbridled enthusiasm he encountered when he introduced it to them caught him by surprise.

“Customers were literally showing off our interface at dinner parties: the system, the battery, how they could see the amount of energy consumption go up in their house if they turned on a washing machine,” said Singh, director of advanced planning at the Canada-based Alectra Utilities, the second-largest municipal utility in North America. “We’re just not used to that level of engagement from customers.”

The pilot that ignited that

passion is Power.House, an intelligent storage solar system for residential customers that includes rooftop PV panels and a lithium-ion battery installed behind the meter. The systems are autonomously controlled through software to simulate a larger power-generating facility. The pilot began with just 20 homes, but Singh said it could eventually expand to include up to 30,000 homes.

In addition to protecting against outages, Singh believes Power.House will help customers save money on their energy bills by making them both producers and suppliers in a distributed energy resources network. By generating their own energy, he said,

customers can send surplus power back to the grid for additional credit.

These days, Singh said, customers want more choice and autonomy, and are “relying more on taking their energy generation and consumption into their own hands, especially with an increase in hazardous weather.”

But if thousands of residences, factories, farms, and businesses start producing and selling energy, things can get very complicated. To ensure the accurate and safe documentation of a growing number of energy transactions, forward-looking utilities like Alectra are beginning to look to an emerging digital technology:

blockchain.

“The energy services market is in an ideal position to benefit from blockchain technology,” said Singh. “It’s this value chain that has a bunch of intermediaries and complex exchanges of information across a completely distributed network of market participants.”

In the Power.House pilot, blockchain technology provided by IBM allows each unit of electricity to be traced from the point of generation to the point of consumption using the local electricity distribution network. It combines a tracked energy transaction with a financial transaction, making the process simpler and safer. And it can remedy

any challenges with an open, transparent, and timely exchange of energy for value.

“Trust, visibility and transparency are fundamental for the efficient functioning of the market,” Singh said. “It also allows us to integrate energy systems with secondary systems like financial services systems.”

Blockchain’s arrival coincides with the shift of energy generation from large-scale power plants to a network of super-smart and super-clean energy sources. It also coincides with the rise of microgrids, which are smaller grid systems linked to localized power sources often called DERs. By 2021, experts estimate, off-grid energy will reach cost and performance parity with

grid-delivered energy.

Under the right conditions, an Alectra release notes, the energy generated by this virtual power plant could “result in the potential to defer energy infrastructure investments by at least two years in the late 2020s.”

“We will rely less on deploying hardware and capital in the field and move more toward a market-based approach for procuring energy services,” Singh said.

At a time when smaller startups are nibbling at the bottom line of larger utilities, Singh said, companies like Alectra have the potential to lead the way in the renewable energy sector due to their incumbent “trust” advantage.

“In a fractured renewable energy market, there are a lot

of young startups that show up and then disappear,” Singh said. “Utilities are in a unique position to bring a lot of credibility to the renewable sector, especially as many customers still see it as a fringe concept. They’re seen as a trusted advisor and authority that is able to communicate to customers when other service providers or other technologies are equally trustworthy.”

Utilities should be flexible when catering to the evolving needs of their customers—even if that means investing in distributed solutions over traditional infrastructure. The success of the Power.House pilot has provided that important lesson for Alectra’s CEO Brian Bentz.

“As a utility, I should be

as agnostic with a behind-the-meter, sustainable, customer-empowering solution as I am with poles and wires,” Bentz said. “In fact, I should probably favor the former more than the latter because it does empower consumers and it’s more sustainable, assuming economics are relatively close.”

In the Power.House pilot, technology provided by IBM blockchain allows each unit of electricity to be traced from the point of generation to the point of consumption using the local electricity distribution network.

How the cloud could save your life in a wildfire

by Jordan Teicher



Kenji Kato, the creator of Wildfire Report, is using the cloud to disseminate life-saving information.

In the summer of 2014, fire surrounded Kenji Kato's hometown.

Between July and August, the Carlton Complex Fire burned more than 250,000 acres and destroyed hundreds of homes across north-central Washington, including Omak, the city where Kato grew up, and where his parents and one of his brothers were all living. Today, it remains the largest single wildfire in Washington history.

At the time Kato was in California, where he works as a principal research engineer at NASA. He couldn't get to Washington that summer, but as he watched the crisis unfold, he knew he wanted to do something to help his community back home. So Kato did what he does best: He got on his computer, and he started tinkering.

"I know from being in some of these fire areas that individuals affected by these fires usually don't have access to anything more than a paper map to find out the fire boundaries," he said. "While the data is electronically available it's not done in a way that the average individual can easily access."

Quickly, Kato figured he could take publicly available geographic data from NASA, NOAA, and the Forest Service and apply

it to fly-through videos of impacted areas that would make the fire's path and speed easy to understand. He started posting the videos to YouTube, and as they amassed tens of thousands of views, he realized he'd touched on a need that wasn't being addressed anywhere else.

"The presentation is a huge element. There are well-intending groups that put the data out but it's just not done in a way that the average user is able to understand," he said.

Four years later, wildfire season returned, and on July 31, Washington Governor Jay Inslee declared a state of emergency. Back in California, Kato knew he needed to figure out how to bring his wildfire information to a wider audience. He saw the opportunity when he heard about Call For Code, an initiative challenging developers across the world to build disaster relief technology using IBM and open-source software. That August, he attended a Call For Code hackathon and made some crucial steps toward scaling his project.

With the computing power and speed of the IBM cloud, he's now able to source data sets automatically and build scores of new videos automatically. And with a new mobile app, he's

able to get those videos out to individuals and first responders seamlessly.

"Whenever you grab it, you'll have the latest data. You can browse and interact with a map, and you can watch a short customized video of your area," he said. "You can also add notes to the map and sync that to the cloud, which will help other people."

Kato's app, Wildfire Report, is still in the pilot phase. But he believes it could soon transform the way firefighters do their jobs and revolutionize the way people navigate in life-or-death scenarios.

"In the past, wildfires wouldn't typically move at these crazy breakneck speeds we're starting to see. With the Camp Fire, the Carr Fire, the Napa fires, they moved so quickly that traditional first responder systems didn't have a way of getting this information out to people quickly," Kato said. "The idea of the app is to have an automated system that can help with that."

Wildfire Report is designed to be "offline first," meaning its core features are built to function with or without an internet connection. That's important for firefighters, Kato said, who often lose network connection when they head into a fire. It's also important for people trying to safely

escape a wildfire's path when other communication systems fail.

"In remote areas, if a fire takes out one of the primary cell phone towers, you lose the entire network in the area. A lot of these areas don't have the best cell coverage to begin with, so the combination makes it really hard," he said.

For Kato, hackathons are "mental sporting events" that allow him to experiment with new technologies and stay engaged with the latest developments in the tech industry. But they also present opportunities for him to contribute to the social good.

"There are people out there that aren't just out to build the next social sharing app and make a billion dollars out of it. They genuinely want to make the world a better place, and they can use their skills to do that," he said.

Will your code change the world?

<http://ibm.biz/IndustriousMag-CodeResponse>

To handle loss claims following natural disasters, insurers turn to AI

by Christie Schneider

In October 2018, Hurricane Michael struck Florida with 150 mph winds and 31-foot waves. Recorded as one of the strongest storms to hit the Florida Panhandle in 100 years, the hurricane ultimately caused \$25 billion in damages, according to the National Hurricane Center.

An estimated three-quarters of Bay County, Florida households were impacted by the storm, which completely demolished some cities.

Insurance providers needed to act immediately to help get people back on their feet. Providers also knew that quickly preparing for a sudden influx of catastrophic loss claims could strain resources.

“A single event the size of Hurricane Michael creates

a tremendous amount of pressure for insurance companies to maintain a high level of service,” said Anthony Peccerillo, Vice President of Information Technology & Strategy at CodeObjects, a cloud-based property and casualty insurance platform.

“Having to prepare for one or more catastrophes in a short period can push the capabilities of even the best organized insurance providers,” Peccerillo said.

With Hurricane Michael, insurers anticipated a surge in customer service calls but didn’t know whether they could quickly and seamlessly field them all. Third-party call centers are typically outsourced by insurance providers during natural disasters, but these

agents usually do not have the knowledge or authority to answer common policy questions. As a result, wait times can be extremely long.

“Imagine the frustration of a customer when, after waiting 30 minutes to finally report their claim, an agent is unable to tell them the deductible amount on their policy,” said Peccerillo. “This creates a very disjointed, confusing and aggravating experience.”

CodeObjects’ virtual assistant, InsurBot.ai, was created using IBM Watson for this exact purpose. The self-service solution allows customers to ask questions, whether through text, chat, or voice interactions. InsurBot.ai has a thorough understanding of the insurance domain and is

able to file a first notice of loss, check a payment or claim status, get a quote, make a payment, or answer questions on deductibles or coverage.

It was first used during Hurricane Irma and analyzed approximately 50,000 calls to learn how to enhance the customer experience.

“InsurBot leverages AI and our insurance domain to consistently handle the most common transactions, allowing customer service representatives to invest their valuable time on elevating the level of service offered,” said Peccerillo. “We saw a real need to turn poor customer service experiences into exceptional ones by leveraging AI.”



Learn more about how CodeObjects is working with IBM to create a frictionless experience for insurance customers, even during disasters

<http://ibm.biz/IndustriousMagCodeObjects>



5G changes everything

by Justine Jablonska

Around the world, telecommunications networks are gearing up to launch 5G in 2019. That'll mean more connected devices than ever before, phones that can be used as VR headsets—and represents a profound industry shift.

To learn more, *Industrious* spoke to Marisa Viveros and Arpit Joshipura. Viveros leads strategy and offerings of IBM's telecommunications, media, and entertainment industry, where she focuses on 5G network and its business implications. Arpit Joshipura is the Linux Foundation Networking general manager. He works, speaks and writes widely about open source software.

Is 2019 the year of 5G?

Viveros: For me, 5G is the next technological change in our industry. There's an extreme demand for applications with rich user experiences—including video—with high-speed, low latency and energy efficiency. 5G has the characteristics to enable the requirements customers and enterprises have now and will have in the future.

5G is an important mobile communication technology. The possibilities are very exciting, and our industry needs changes on a periodic basis.

Why are changes a good thing?

Viveros: When mobile communications began a few years ago, we had second generation, or 2G, that allowed us to make phone calls. The phones were extremely big, and batteries only lasted a few hours. Then we went to 3G: phones got much smaller, allowed us to send short text messages with multimedia. The whole area—not just connectivity but communications—got richer. Then we went to 4G, which opened the wide set of applications with internet connectivity we see in mobile phones today. New business models came along, from making travel reservations to paying for parking via an app.

Every generation has brought not only faster communication and better user experience, but new possibilities from a business perspective.

Joshipura: Each technology change Marisa mentioned was mostly a linear change: speed went up, bandwidth went up, latency went down.

5G is a complete mindset change. Two important points here.

First: with those tech advantages, you have machine-to-machine communications. You move from 3.5 billion phones to 20 billion connected devices and connected things. It's a completely different connectivity, transport and application game. The scale is exponential.

Second is the process change, including automation and business processes. Today's manual processes won't work. We cannot have an IoT device connected to 5G that's waiting for an operator for service.

Those two aspects are what makes 5G so exciting. We at the Linux Foundation, along with IBM and others, are working on solving the second issue—the network automation. Making sure that telecommunications networks are autonomous, automated and zero touch.

For telcos, why is 5G such an important play in 2019?

Joshipura: Technologies come in cycles. There's a set amount of time required to standardize the radio technology. That standardization happens all the way from radio to devices to PlayStation.

What's different is that we in the software world are getting ahead of the standardization game thanks to open source.

5G would normally first be deployed on devices, and then the back-end.

Here, networking systems are getting ready from an operational perspective before the first radio tower hits.

Viveros: Building networks takes time. To go from metropolitan areas to rural areas can be three-year, even five-year investments for telcos. They need to start now so that 5G can be massively available by 2021, 2022.

Building the network is one aspect. The other is building the devices—all the new model phones and sensors Arpit mentioned—so they can be deployed seamlessly within those environments.

The fact that this takes time is an opportunity for telecommunication companies to apply AI and automation in all aspects of network engineering,



“It’s about doing our research and development in a much less expensive manner, and using the combined power of all the companies working on a particular problem. We can bring all that together for the benefit of our client.”

from design and build to operation and maintenance.

This is almost like a perfect storm that will enable the new user experiences and new services we all want to provide to users in the future, while taking advantage of high bandwidth, low latency and improved energy management.

How can we monetize 5G?

Viveros: That question is coming up for each of our clients, not just in telecommunications but also industries as well.

One of the driving premises of 5G is that it will enable Industry 4.0—more connected devices, deployment on the manufacturing floor, even remote surgery. That level of precision will be enabled by those fast, low-latency networks. 5G brings an opportunity for telcos to participate in a much larger and more diverse ecosystem. That’s exciting because enhancing that ecosystem with 4.0 will bring new revenue streams for the telcos.

Joshiपुरa: With monetization, you have to separate the end users from the vendors and system operators.

Operators spend a set of capex (capital expenditures) on services to get technology. For that, they have a revenue stream they get from consumers, or business services.

My view is that 5G actually changes the business model.

The first thing that happens is the total addressable market goes up. Now you have more, larger equipment types beyond phones and infrastructure gear. There’s a larger capex pool from a market size perspective.

Your savings on operational expenses, opex, will go down in terms of automation. Operators will spend less money on maintaining and managing networks. They will move that money over to services and customization, to development, to enable new applications.

With suppliers, Marisa said it well. Systems vendors and integrators now have a broader base to capture in terms of selling. But the money they will receive is more services, customization, integration.

Viveros: That’s a perfect segue into why there’s a new wave of open source software. Other industries, like government, have been on the wave of open source for some time. For our industry it’s new, and it’s becoming more and more relevant and important.

It’s about doing our research and development in a much less expensive manner, and using the combined power of all the companies working on a particular problem. We can bring all that together for the benefit of our client.

Arpit and I started working together on an open network application platform, for network management and operation. That’s now become a bigger umbrella, the Linux Foundation Networking project.

We’re collectively responding to clients who say, ‘I need all this sophisticated software but can no longer afford to build it on my own. I need the collective power of all developers to make that software a reality.’

Most importantly, sharing common architectures and platforms across different telcos and providers will allow us to get to the scales we’re all looking for. Then we can move to the next level, add more valuable services.

Joshiपुरa: Very well said.

The telco industry is 143 years old. I’m counting since the phone was invented.

In just the last three years, it’s moved into an open source

world. With projects like the one Marisa described, we have the participation of nearly 70 percent of global subscribers through the service providers. We have all 10 networking vendors participating actively. We’re working closely with all the standards bodies. We have a huge developer base and releases that are moving into deployment and production. And we have a big certification program to onboard virtual network functions (VNF) automatically.

We’re getting to a new wave of automation based on open source that will enable end users and suppliers to cooperatively build and get ready for the world of 5G.

What will this mean for the workforce in the short-term and the long-term?

Joshiपुरa: Since 5G is a mindset change, that includes technology, process, and people.

From the people perspective, there’s quite a bit of retooling required. Admins who historically ran the network now need to understand software development. They don’t necessarily have to be software developers, but they need to understand it.

We’ve already seen telcos launch huge training programs to allow for that retooling.

People’s mindsets need to change, and their skill sets need to be updated—these should include Software-defined networking (SDN), Network functions virtualization (NFV), Cloud native, OpenStack. Many of these courses are offered by the Linux Foundation and are free. IBM also has a number of trade courses. Everyone is trying to help reskill people.

In the next three years, we’ll see a whole new breed of engineers trained in DevOps and born with this new mindset.

Thirty years ago nobody got trained on the guts of the system. Now they know what goes inside, so they’d better get trained on it. Universities are stepping up on courses, organizations like ours are also stepping up.

Viveros: I fully agree on training current employees on hardware and software engineering. And there are so many tools right now to help them do their jobs better and in a more contemporary way. That learning curve may not be as big as suspected.

I also want to bring up the developer community. So many people of all ages are pumping out code, contributing to big missions around the world. Capturing that community’s new ideas into this new ecosystem is important.

We recently did a hackathon with a number of young people in the telco space. We gave them a number of APIs and challenged them to develop new applications. They developed what they called an “internet of parks.” They put a sensor into every trashcan in the park, and each time the sensor detected the can was full, park workers would come and clean it. So the park was always clean.

I couldn’t have imagined an application like that, but the young minds—over a weekend—got it done.

Can 5G modernize your network?

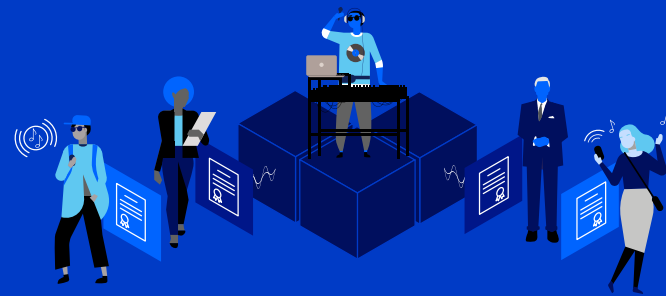
<http://ibm.biz/IndustriousMagNetwork>

This is the music industry on blockchain

Blockchain has the potential to save the music industry billions by transforming the rights and royalties process and by nurturing the relationship of artists with their communities of fans.

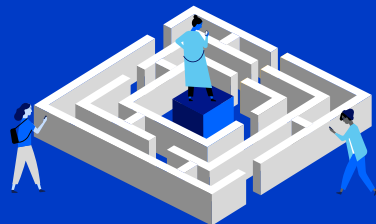


Smart contracts



Today, streaming services require intermediaries to ensure fairness in the artists' rights management process, which means music creators need multiple contracts and middle men to protect copyrights and distribute their music.

Building trust



Identifying music copyright and splitting royalties is a difficult task today, because of mistrust between organizations that own relevant music industry data.



Blockchain can simplify digital rights management through 'smart contracts' in which all proceeds go directly to the music professionals involved with the content and all stakeholders receive their fair share of royalties.



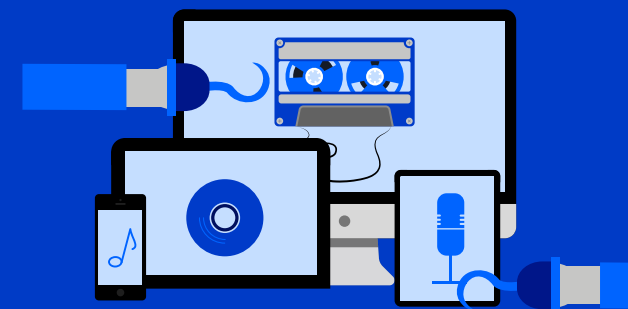
With blockchain, relevant information about music content can be encoded onto the blockchain, creating a permanent and encrypted record that's accessible and transparent across the ecosystem.

Fan-focused

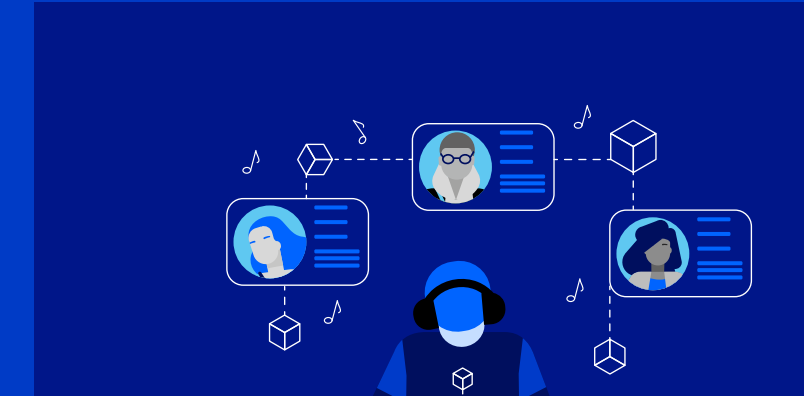


Today, fans have a multitude of tools for consuming and distributing music, but music professionals only have a partial view of how their music is shared and consumed.

Preventing piracy



Piracy is a never-ending struggle, eating into royalties and revenue for everyone in the music business.



Blockchain can enable artists to intimately know their fans and address their music habits accordingly with targeted incentives and offers.



Combined with other technologies, the security that the blockchain provides can be leveraged to prevent unauthorized content distribution.

As golf evolves, retailers swing toward digital

by Marshall Wright



Golf is attracting a growing number of players from all walks of life through new channels, including simulators and game experiences like TopGolf. In 2018, nearly a quarter of the 32 million people that participated in the sport did so in an emerging off-course activity, according to a National Golf Foundation report.

For golf retailers like PGA TOUR Superstore, those new audiences call for a transformation in how retailers do business.

“Any time someone puts a golf club in their hand, that’s good for us,” said Randy Peitsch, SVP of Operations.

The golf equipment and apparel chain is consciously evolving to meet the demands of new and diverse customers, according to Peitsch. It’s adopting a customer-centric strategy, but requires folding technology into the process and putting data to work.

“Two years ago, we didn’t have a single iPad in our stores,” said Peitsch. “Now our associates are using them everywhere to enhance and personalize the customer experience.”

And iPads are just the beginning. His stores now include club fittings, a unique 3D measurement technology that tracks swing data, and next-generation golf simulators.

“It’s fun to see the reactions of consumers when they see the realistic nature of the virtual experience,” Peitsch said. “They can walk in and play Pebble Beach in 30 minutes.”

Technology doesn’t just benefit customers. It also benefits what he says are the chain’s most important asset: the associates.

“Consumers generally don’t care about the stuff happening in the back room. They just want a great experience,” said Peitsch. “But we care about it deeply. The technology that allows our associates to be more mobile, such as iPads, frees them up to spend more time with the customer.”

At a time when many sporting goods chains are shutting their doors, PGA TOUR Superstore has opened a slew of new locations and invested heavily in elevated store experiences. Its experience reflects a broader retail industry trend: PGA TOUR Superstore, like many of today’s thriving retailers, is finding that next-generation technology is a critical tactic to stay competitive.

Today that means crafting cutting-edge store experiences. Tomorrow it could mean crafting personalized customer experiences by using AI to connect in-store data with data generated online.

Peitsch views the chain’s embrace of technology as smart business. But he also sees it as part of the company’s ethos.

“Steve Cannon, CEO of our parent company AMB Group, has a saying: ‘Culture eats strategy for lunch,’” said Peitsch. “If we don’t have the right culture everything else falls apart. It’s about participation from our side. Consumers sense it the minute they walk into our stores.”

As the PGA TOUR Superstore continues to innovate, Peitsch said, it will be careful to continue honoring the traditions of the sport. The way forward is undoubtedly with new customers who are experiencing the sport in their own way. The trick is having a sophisticated enough operation that can flex to those individual expectations.

“We’re always looking for ways to bring more people into the game and engaging consumers on their terms,” he said. “They want to connect with brands they love, and we are a passion brand.”

Theresa Pardo, PhD

“It anchored a career-long pursuit of enabling technological breakthroughs, of enabling access to technologies that can pave the way for value creation, exploration and discovery.”

In the mid-1980s, two physics professors—one in Schenectady, New York and one in Palermo, Italy—were collaborating on particle physics research.

They spent summers together at CERN, and the academic year at their home institutions. During the academic year they taught and wrote papers based on data from the previous summers. One would write or edit a draft and then drop it in the physical mail. Six weeks later that draft might arrive. Sometimes it didn't.

I was a young computing professional then, responsible for faculty computing and networking support at Union College. Among the faculty I worked with was the NY-based professor.

At the time, we'd been working for months to make the college a node on BITNET, one of the earliest store-and-forward university-based email networks. The first email sent out over BITNET from Union College was to Palermo, with a manuscript about particle physics attached.

Minutes later (it was the 1980s, after all, and all we had was a 9600-baud connection), we had a response with another manuscript attached.

There was a pause. A silent moment of near disbelief. Of joy.

The professor teared up. Science and collaboration had changed, forever.

Today, as I work with governments around the world who are working to create public value through innovative uses of technology, I often think of that first BITNET email exchange.

It inspired me, and has anchored a career-long pursuit of enabling technological breakthroughs, of enabling access to technologies that can pave the way for value creation, exploration, and discovery.

Theresa Pardo, PhD, is the director of the Center for Technology in Government, and a research professor at the Rockefeller College of Public Affairs and Policy at the University at Albany, State University of New York. Under her leadership, CTG UAlbany works closely with multi-sector and multi-disciplinary teams from the U.S. and around the world to carry out applied research and problem solving projects focused on transforming public service through innovations in policy, management and technology. In 2018, she was selected as one of the top 100 influencers in digital government globally.



Dessa Darling

“Working with the Center for Magnetic Resonance Research at the University of Minnesota and neurofeedback clinician Peniyean Gracefire, I was able to examine love from an entirely new vantage point—namely, from inside my skull.”

I could see, in 3-D images, which parts of my cortex were involved in loving someone. And doing so prompted all sorts of new questions about the nature of romantic connection, and the way our minds, bodies, and behaviors are woven together.

On stage with the orchestra, I got to share those revelations, and doing so added an extra dimension to the love songs we performed together.

Dessa has been published in the New York Times, appeared on Billboard's Top 200 charts, and performed in grand halls and grimy basements around the world. Her essay collection, My Own Devices: True Stories from the Road on Music, Science, and Senseless Love, is available now. For photos, tour stories, and concert listings, check dessawander.com or follow her on Twitter, Facebook (@dessarling), or Instagram (@dessa).

To me, science and art aren't polar opposite ends of a cultural spectrum—as they're sometimes presented in our culture. In their own ways, they're the tools human use to make sense of the world.

My venture into neuroscience informed one of the biggest projects of my career—a collaboration with the GRAMMY-winning Minnesota Orchestra that began in 2017. As a rapper and a songwriter, I've spent a lot of time investigating the nature of romantic love in my lyrics. But working with the Center for Magnetic Resonance Research at the University of Minnesota and neurofeedback clinician Peniyean Gracefire, I was able to examine love from an entirely new vantage point—namely, from inside my skull.



Ian McGarrigle

“The untapping and unleashing of that enormous data source began the revolution in retail that is still gathering pace.”

Having spent close to 35 years as a retail industry journalist, editor, publisher, and now chairman of the World Retail Congress, it is only when I stop to think about it that I realise the sheer enormity of the changes that have completely reshaped both journalism and retailing.

At the start of my career we worked with typewriters and printed using hot metal. But by 1988 I had joined the launch team of Retail Week magazine, which was the first-ever title in the UK to write about the whole of the rapidly modernising retail industry. In keeping with this forward-looking magazine, the forward-thinking management provided us journalists with some of the very first computers to produce copy with.

What were we writing about in the late 1980s? The boom in specialty retail chains, the rise of the supermarket and hypermarket, shopping malls and big edge of town sheds and warehouse retail formats. It was also a time dominated by some major retail personalities. Behind all this excitement and glitz though was a technology just beginning to emerge as the clear “future.” Consequently, our news and features

pages wrote constantly about it and our advertising pages sold its incredible qualities. That technology was Electronic Point of Sale (EPoS): a cash register that was also a computer, which not only recorded and processed transactions faster and more efficiently but unlocked for the very first time a true understanding of what was being sold in-store. The untapping and unleashing of that enormous data source began the revolution in retail that is still gathering pace.

I remember writing stories about major UK retailers such as Boots and WH Smith, Tesco and Sainsbury’s who spoke ecstatically about their newfound ability to streamline ranges, stop selling things they didn’t realize no one was buying and to expand lines customers did want. That drive for knowledge and efficiency that was helped by the arrival of EPoS continues to define today’s retail winners.

Ian McGarrigle is the founder and Chairman of the World Retail Congress.



In India, Bestseller turns to AI to keep stores relevant

by Jordan Teicher

The fashion retail business in India, Vineet Gautam said, is unlike any other in the world.

"India is just not a country, it's like a continent. You have hundreds of cities. You have many states. You have hundreds of religions. You have 500 dialects," he said. "The taste of consumers changes every few kilometers and that's the biggest challenge for anyone who is entering the country and trying to understand consumer behavior and understand what consumers want."

As the CEO and India country head for the Danish retailer Bestseller, Gautam knows that well. In India, he said, you simply can't run a successful business without a plan to take the country's diversity into full account.

"I think people who will win in India's fashion industry are people who will be able to understand what the consumer wants and be able to tailor-make their collections or their assortments and be able to fulfill consumer demand," he said.

To a certain extent, Gautam said, fashion is all about gut. But gut only goes so far. Today, as a result, retailers are facing a crisis of unsold inventory. Tons of clothing ends up in landfills every year. And tons more ends up on a discount rack.

"Prioritizing the right product at the right time is the key to our business," he said.

With the right technology, Gautam said, key decision-makers in India's retail world could enhance their intuition and help them forecast better in order to deliver what consumers want in each store.

"We can look at Excel numbers, we can look at mega trends, but we are not able to analyze every aspect of a product and compare it to others. Human memory is limited," he said.

Bestseller saw an opportunity to expand its capabilities when company leaders recently visited IBM labs in Bangalore and experienced the power of Watson firsthand. Gautam and other Bestseller leaders provided Watson some data about some of its products, and Watson came back with deep analysis about how they might perform in stores.

"I think that was our tipping point," he said. "We said 'Watson is going to be our engine to deliver what we require in our business.'"

Today, Gautam said, Bestseller is embarking on a journey to become a fully AI-driven enterprise. In the near future, Bestseller plans to use AI to determine the right assortment plan for each store, predict the next best product to incorporate into its mix, and improve the efficiency of its supply chain. The end result, Gautam said, will be happier customers in stores, and a reduction in the amount of inventory that goes unsold.

"The consumer promise is to have right product at the right time, but the business promise is how to improve the efficiency of the product. We want to fulfill both promises," he said.

Today, Gautam said, 85 percent of Bestseller sales are retail and 15 percent are online. While the share of online sales will likely continue to grow, stores will remain a crucial part of Bestsellers' business. That sentiment is echoed across the retail industry. According to a report from RSR and IBM, 63 percent of retailers whose sales are outperforming their competitors' say stores will be an important part of how consumers shop their brand three years from now. Fifty-five percent of those retailers plan to open new stores in new markets.

If stores are going to drive business for Bestseller in India and beyond, Gautam said, they need to continuously evolve. Leaders, as a result, need to keep evolving too.

"I think the biggest mistake retailers are making in India is still taking the customer for granted," he said. "Retailers are not changing as fast as the consumer need is changing. They still believe their business model, which was yesterday, will survive tomorrow, but consumers are changing faster than we think. I think that's where the challenge remains."



Vineet Gautam, CEO and India country head for Danish retailer Bestseller.
Photo: Jordan Teicher

Watch the video to hear more from Vineet Gautam

<http://ibm.biz/IndustriousMagBestseller>



Consumer



Why one company believes a smart workbench is the key to a smart factory

by Jordan Teicher

Today, Industry 4.0 and the Industrial Internet of Things are monumental forces in manufacturing, transforming the way companies gather data and do business.

But five years ago, it was a different world. Back then, Keith Jackson, the CTO of UK-based aerospace component manufacturer Meggitt, hadn't heard of either concept. But he knew he wanted to deploy digital technology at the company.

"We used digital technology all the time ourselves—for shopping, for directions—but then when it came to work, particularly in manufacturing, it was very often job cards and pieces of paper tracking things through the factories," he said. "We realized that can't be right."

Jackson started righting the course shortly thereafter, when he started visiting the University of Sheffield's Advanced Manufacturing Research Centre. There, he and a small team of

designers began combining cameras, sensors, lasers and other technologies to create what would ultimately be called the Closed Loop Adaptive Assembly Workbench, or CLAAW.

"We started thinking about how we really embrace the human being and the digital world so they work together," he said.

CLAAW's purpose, Jackson said, is to make assembly quicker, easier and more efficient. To that end, it uses laser projection to guide operators through the assembly process, highlighting where components need to be placed. It uses sensors to verify that the component has been positioned properly, and it uses cameras to keep detailed records. Throughout the entire process, the bench captures performance data, which Meggitt can analyze to evaluate and ultimately improve its procedures.

"That's where IBM comes into it," he said. "All the data

we collect is poured into our local cloud, and we can look at that with our dashboard and tools."

Jackson and his colleagues are still working to perfect CLAAW before they roll it out to factories across the U.S. and the U.K. in the coming year. But feedback from employees is, so far, overwhelmingly positive.

"People in the factory were invited to come and see it and look at it and comment and give input. In the end they are the experts," he said. "People looked at it and said, 'Wow, we like this.'"

Jackson expects CLAAW will go a long way toward improving output, quality, repeatability and traceability at Meggitt. But he said it's just the first phase of the company's long-term Industry 4.0 makeover, an initiative known as Meggitt Modular Modifiable Manufacturing, or M4.

Meggitt is part of a growing number of companies using emerging

manufacturing technologies to embrace the potential of Industry 4.0. Across the industry, a forthcoming report from IBM's Institute for Business Value finds, forward-thinking organizations are leveraging AI-enabled IoT. As a result, they're reporting faster revenue growth and higher return on assets, more agility in their supply chains, and better order performance.

Meggitt, for one, sees its digital transformation as crucial to its future success. At a time when the demand for aircrafts is growing exponentially, Jackson said, component manufacturers need to do everything they can to ensure they deliver quality products at the right scale.

"For us, it's about faultless delivery. It's about zero defects. It's about making the product work the first time, all the time. That's what our customers want from us," he said.

ExxonMobil thinks quantum computing could power a new energy revolution

by Editorial Team



Dr. Vijay Swarup has a tough job.

As the Vice President for Research and Development at ExxonMobil, his mandate is twofold. On the one hand, he needs to ensure worldwide access to affordable energy. On the other, he needs to minimize the impacts of climate change.

Those goals aren't mutually exclusive, Dr. Swarup said. But to achieve them both, the energy industry can't depend on the power of today's traditional computers to develop next-generation energy and manufacturing technologies.

"We need a paradigm shift," Swarup said at the 2019 Consumer Electronics Show (CES) in Las Vegas. "That's where quantum comes in."

At CES, Swarup announced that ExxonMobil would become the first energy to join the IBM Q Network, a first-of-its-kind community of Fortune 500 companies, startups, academic institutions and research labs working with IBM to explore quantum's applications for business and science.

"Here's an open secret: Our computers are not good at everything. There are actually problems in the world they simply cannot touch. It doesn't matter how many transistors we throw at them or how much data and AI we have available. They're simply intractable problems," said Dr. Dario Gil, Director of IBM Research.

Quantum computing, he said, is a fundamentally new form of computation that brings together the world of information and the world of quantum physics. It allows its users to solve those "intractable problems."

ExxonMobil has a lot of big problems it would like to tackle, from optimizing a country's power grid to performing more predictive environmental modeling, to discovering new materials for more efficient carbon capture.

"Quantum computing can potentially provide us with capabilities to simulate nature and chemistry that we've never had before," Dr. Swarup said. "As we continue our own

research and development efforts toward advancing new energy technologies, our agreement with IBM will allow us to expand our knowledge base and potentially apply new solutions in computing to further advance those efforts," Dr. Swarup said.

IBM Q Network provides participating organizations with quantum expertise and resources, quantum software and developer tools, and cloud-based access to IBM's most advanced and scalable commercial universal quantum computing systems. Today, the network also includes some of the world's pre-eminent research laboratories including CERN, Argonne, Fermilab, and Lawrence Berkeley. The network, said IBM Q Strategy and Ecosystem Vice President Bob Sutor, is just as important for IBM as it is for the organizations it serves.

"As we continue to explore practical applications for quantum computing, it's critical we partner with businesses

and organizations from a variety of industries and disciplines," Sutor said.

That partnership is especially crucial when it comes to energy, the backbone of all business and life. As the industry enters a new era of volatility, energy companies are forcing themselves to look beyond process enhancement and toward fundamentally reinventing the way they do business.

In the turbulent years to come, Dr. Swarup's job may never become simple. But with the right technology backing him up, it could get a whole lot easier.

“The future application of sensor technology in vehicles is what fascinates me. Imagine the intelligent, autonomous car of the near future being able to exhibit the same 5 senses that humans do. Smelling sensors will detect high pollution areas and recommend alternative routes, hearing sensors will listen and report potential fixes for that ticking noise in the engine, touch sensors will detect occupants’ health issues through steering wheels, seats and safety belts, seeing sensors will watch the environment around the car for any dangers and take corrective actions, and finally, taste sensors (yes, even taste!) will identify foods and other substances that are spilled on seats and identify cleaning needs.”

Ben Stanley
Global Research Lead, Automotive,
Aerospace & Defense
IBM Institute for Business Value

“Infusing AI into the platforms we use on a day-to-day basis for fact-checking and machine learning in real time will result in significant strides towards solving major societal problems like fake news, hate speech and unconscious bias—propelling humanity into an age of equality and understanding.”

Gabrielle Mohamed
Campaign Manager, IBM Industrial Market

“The very nature of technology is that it advances along its edges, relentlessly and for the most part irreversibly: this is how it always has been and always will be so, and it’s difficult to predict which of those edges will advance more rapidly than others. What is quite true is that the edge front of technology is expansive, and as such I assert that the most interesting and useful tech to come forward will involve the art and science of building systems from all those parts along the edges. While AI will progress, the most important thing for tech to do is to engineer systems for which AI is a component.”

Grady Booch
Chief Scientist for Software
Engineering, IBM Fellow

What will the next great area of exploration in tech be?

“As open technologies like 5G, Edge, AI/ML, SDN/NFV and Microservices all go mainstream, innovative companies will explore new apps that take advantage of Edge Cloud and low latency network at their fingertips. These new ‘edge apps’ will be dependent on unified Open Source Frameworks to operate quickly and come to life.”

Arpit Joshipura
Linux Foundation Networking General Manager

“The next great area of tech exploration will be secure data management—with the consumer in control. A consumer’s data is spread all over the world in thousands of clouds, and corporations are all working to manage and profit from that data. Imagine a world where the consumer virtually holds and manages a stack of containers with their own data: purchase data, engagement data, social data. AI models would help the consumer share the right data with the right people and trace how the data is used and where that data goes. And in return, organizations could clearly communicate how they are using the data to make better experiences for the consumer.”

Catherine Reese
VP, IBM GBS Advanced Analytics

“The next great area of exploration will be in the pursuit of applying chemistry and materials theory to industrial use cases. Research on predictive technologies for industrially-relevant challenges will have broad and disruptive impacts on industry and academia. Towards this end, both established and emerging technologies will need to be leveraged; for example, quantum computing for molecular simulations.”

Jeannette M. Garcia
PhD, IBM Research Global Lead for Quantum
Applications in Quantum Chemistry & Science

“The next frontier in tech isn’t so much a brand new concept, but the integration of technologies that have been somewhat impactful when used in isolation, but truly transformative when combined. A good example would be IoT; by itself it has allowed for greater granular tracking of assets or inventory, when combined with AI and blockchain, it becomes an indisputable system of record that is self-sustaining and self-regulating—truly transformative.”

Saif Rivers
Partner, IBM Supply Chain Practice Lead

What will the next great area of exploration in tech be?

“Trust. From billion-dollar fines over antitrust, data privacy and taxes, research highlighting the perils of social media addiction, to evidence of fake news, and extremist content on the internet, people today feel overwhelmed, insecure and wronged. Companies need to invest in earning people’s trust in their mission and the services they provide to rebrand tech as beneficial to society.”

Ashesha Mehrotra
IBM Developer

“Tech will examine and create new investment in space focused on mining, pressurized living and transportation. Record venture capital was spent on space in 2018 and it’s been predicted to be a trillion dollar market by 2040. It’s a market where creativity, maths and engineering act in equal measures to move forward. As we continue to deplete our current planetary resources at unprecedented rates, we will need alternatives such as space and oceanic pursuits. Improved materials, flexible electronics, hardier robotics and consumer interest all add up to increased market viability.”

Cristene Gonzalez-Wertz
*Electronics Research Director
IBM Institute for Business Value*

“Without question, humanity will need to explore and apply the power of emerging super computing technologies like quantum to address climate change. For the past three years, Fortune magazine has said the #1 concern of business leaders is extreme weather events. Climate change is increasing and worsening the number of extreme weather events that deliver over \$1 billion in damages. In 2018 there were 14 such events in the US alone, including hurricanes to wildfires—twice the annual average between 1980 and 2018. Technology will be crucial to predict and cope with these events while we deal (or not) with the threats climate change poses to our planet and survival.”

Timothy Coates
Portfolio Marketing Leader, IBM Global Markets

“We have become consumed with our smartphones, so much so that we are now purposely seeking time away from them. The next great area of tech exploration will be in audio, which provides a way in which we can access stories, critical information and creativity without the constant distraction of our screens. We’ve already seen the headphone and smart speaker market explode, and high quality audio content is widely and freely available. The time is right for a total screen disruption.”

Katie Keating
Brand Strategy Lead for IBM Watson Health

“Gartner predicts the future as having ‘digital twins,’ where a physical or system entity can be replicated digitally. So between IoT, robotics and AI, the exploration of tech will be how to create a seamless experience between real and digital. Two areas that have always been big unknowns for humans are space and the ocean. Digital twins + Galaxy & Sea = Tech Exploration.”

Christina Altomare
*IBM Strategy and Integration Leader
GBS Marketing*

“The next great exploration in tech will have to be a reconciling and reflection of tech’s impact in the world: the ethical considerations and long-term ramifications of what we’re building. Certainly, there is tremendous opportunity to better the world through technology—that cannot be denied—but we must maintain some vigilance about our responsibility to what’s happening to us socially, psychologically, politically and environmentally.”

Christine T. Dee, PhD
*IBM Global Industry Solution Executive,
Telecom, Media & Entertainment*

“One of the most consequential areas of exploration will be centered on how tech helps us negotiate reality. As humans, we inhabit a world of multiple realities driven by the narratives we create about ourselves, our families, communities, organizations, nations, and more. Reality manipulation technology, from deep fakes to codec avatars is not only becoming more sophisticated (beyond magical) but also cheaper and easier to use, inevitably resulting in a future where reality is meaningless and/or exclusively mediated by powerful verification technologies. How can media literacy education, public policy, and the institutions that protect human rights be brought along in this next great area of exploration?”

Camilo La Cruz
Chief Strategy Officer, sparks & honey

“Increased computing power combined with big data and new algorithms and deep learning—all of this is coming together to build new breakthrough technologies.”

—Dr. Heike Riel

