Leadership Trends and Emerging Technologies

Predictions 2023

From AI/ML to deglobalization and resilience: Insights for navigating turbulent times

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The Certainty of Uncertainty

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We start not with a prediction, but a statement of the obvious: Things are kinda nuts right now. The global pandemic is not nearly as disruptive as in its first two years, but the supply chain woes of 2021 begat the panic-inducing inflation of 2022, which has driven world economies toward recession. "We're in a turbulent economic cycle," says Splunk CEO Gary Steele. "One fascinating element is that there has never been a recession in the U.S. where the labor market is as tight as it is, even in the face of rising interest rates. So it's hard to see how these recessionary pressures will play out. No one can predict the future."

True, but that's kinda part of Chief Strategy Officer Ammar Maraqa's job, so: "I'm hopeful that this cycle will not look like one of the doomsday scenarios — a softer landing or a milder recession rather than a severe one," Maraqa says. "Broadly, the current situation looks a little different than the typical asset boom-and-bust scenarios of the 2008 housing market and the 2001 dotcom collapse. The labor market is strong, company earnings are generally good, but we have other macro factors introducing uncertainty — from the effects of Covid to Russia's war against Ukraine. All of these factors can shift quickly, making this cycle particularly hard to read."

Our Asia-Pacific leaders say there's less fear in their region. "Generally, APAC has not been experiencing the same nervousness as you've seen in the U.S.," says Simon Davies, SVP and general manager of Splunk in APAC. "For most of our customers, inflation is certainly a factor, but intense competition for talent is much more urgent."

Europe is definitely seeing the clouds on the horizon, says Petra Jenner, SVP and general manager for Splunk in the EMEA region. "Right now, all the economic factors except employment point toward recession," she says.

"A lot of it is about confidence," Maraqa says. "The more people think we'll have a recession, the likelier it becomes. The psychology of it all is a big wild card."

He notes that sometimes the whiff of a downturn gives companies license to act, so we'll see layoffs. "The turbulence can provide air cover for companies to restructure, to increase focus, to slow their burn rate by reducing hiring or laying off people. That's painful but it's a normal part of the cycle."

Early in the pandemic, some companies had to aggressively forward-invest and hire to handle demand spikes. "Ultimately, a lot of those companies overinvested, and now they are going to have to adjust," Maraqa says. "Again, painful, but that's different than a broad-based recession."

The uncertainty doesn't necessarily mean hunkering down 'til the storm passes, he adds. "You have to be smart and judicious about how you plan for growth. Do robust scenario analysis and defer large fixed investments that would put you in trouble if topline growth declines."

The tension lies in the impulse to minimize risk, on the one hand. On the other hand, he says, "Industry leaders don't miss a chance to widen the gap between themselves and their competitors during a downturn."



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Economic uncertainty kills the appetite for experimentation. Vendors and visionaries will have to lead with value.

It's a tough needle to thread: Growing your business and reinforcing operational and security resilience require investment. Yet the reaction to economic turmoil is to close your wallet and wait.

"But digital transformation is one of those things that you can't completely deprioritize," says Ammar Maraqa. "Organizations will be more nimble, with more incremental funding and a sharp focus on results."

- "Companies are thinking clearly about which tech investments they want to make," says Splunk CEO Gary Steele. "Real value has to be delivered, pretty quickly."
- "Companies are very concerned about investments in the face of a downturn," says Petra Jenner, SVP and general manager for Splunk in the EMEA region. "They're purchasing only what's needed right now, not making any forward-looking investments."
- "Leaders I talk to are very focused on extracting as much value out of their data as effectively and quickly as possible," says Chief Customer Officer Katie Bianchi. "Organizations struggle every day with the complexity of that challenge, and they know they need more prescriptive counsel and a better ease of use from their technology partners."

Robert Pizzari, VP of security in the APAC region, has seen that as he's traveled through Asia. "I've seen far more prudence applied to where investment dollars will be going, together with prioritization of projects and a potential realignment of priorities."

"Cost optimization is a big consideration now," says Dhiraj Goklani, VP of observability in APAC. "Organizations are trying to adopt next-generation technologies, but more cautiously and with a clearly defined business case."

Expect the value focus to center on digital experience, because nothing moves the needle more than direct improvements to how you serve your customers. And nothing moves it faster in the wrong direction than delivering a frustrating or broken interaction when better options are a click away. Which means resilience is a big deal.



Resilience is the new value focus, and strategic orgs are elevating leadership and converging data and tools around it.

Resilience touches two no-compromise areas: the security of your data and systems, and your ability to serve your customers. Resilience is therefore always fundamental, but recently it has reached buzzword status in some corners. A challenge for organizations in 2023 will be separating the buzz from the strategies and investments that will deliver meaningful improvement.

"There are pockets of functional resilience in any organization," says Mark Woods, Splunk's chief technical advisor in EMEA. "Bringing those functional-level pockets together to create full business relevance is the problem for most organizations."

"Resilience comes from strong security posture and a strong app environment," says Splunk CEO Gary Steele.
"Standardization is one essential way to drive resilience.
When you've got a fragmented IT and security environment, with siloes everywhere and a million tools, you're in trouble.
Organizations will drive to a common set of tools and data, including a convergence of security and observability data, to achieve more holistic resilience."

Dhiraj Goklani, VP of observability in the Asia-Pacific region, sees it happening as organizations evolve their monitoring capability to true observability. "Organizations that have invested in legacy tools are trying to unify and simplify the number of tools, or the number of vendors. It's the ongoing effort to modernize, simplify and reduce costs while they are trying to increase visibility of their environment."

Like resilience today, "digital transformation" has meant a lot of things over the past decade or two. Splunk's chief customer officer, Katie Bianchi, says that DX is much more aligned around operational resilience today.

"Systems have to be resilient, because customer expectations have grown exponentially in our high-speed world," Bianchi says. "Application performance and availability are at the heart of a great customer experience and a growing, innovative business."

Combining that with better security, she says, is essential, and she points to automation as a key tool. "Driving scale, efficiency and intelligent decision-making through automation will continue to be a critical trend as companies deal with increasing complexity of their environments, plus talent fluctuations, plus rising types and volumes of cyber attack."

Prediction Deglobalization pressures won't let up.

Although the digital revolution has made our world increasingly connected, the tides have somewhat turned, thanks to a global pandemic and growing political tensions. The effects of deglobalization are being felt across supply chains and through data residency regulations. The **New York Times reported** that France, Austria, South Africa and more than 50 other countries are more tightly restricting the flow of data around the world.

Security and privacy are paramount concerns of data residency laws. Governments worldwide have also become increasingly protective over national data and are voicing concerns about "digital sovereignty" as data increasingly concentrates in U.S. companies. A WEF paper on EU data sovereignty concerns noted that 92% of data collected in the West is housed in the United States, and that no European company is among the top 20 global tech brands.

But it's not just driven by governments. Organizations in the private sector, too, are making moves to contain their data. "Companies are stripping out privacy data and are anticipating laws that regulate privacy and data residency more strictly," says Petra Jenner, Splunk's SVP and General Manager for EMEA. "As organizations are preparing for heightened data residency regulations, they'll have to start serving European customers from European locations, which massively increases deglobalization," says Mark Woods, Splunk's chief technical advisor for EMEA.

GDPR and other regulations are no longer setting the pace they were three to five years ago," says Patrick Coughlin, vice president of GTM strategy and specialization at Splunk. "Today, companies are comfortable making their own data residency and privacy protections ahead of regulation." Simon Davies, SVP and general manager of Splunk in APAC, notes that the sheer rise in data volume has also contributed to deglobalization. "Large organizations process tens to hundreds of terabytes per day, and even get up into the petabytes," he says. "The data has to physically sit somewhere, and if you've been moving between jurisdictions, there are all sorts of costs and challenges."

The net effect of the deglobalization trend will be this: To remain global, organizations will have to think local. Davies says, "Trying to drive a single global solution footprint won't work, for three reasons: the varied legislation, the cost of moving data around, and the different levels of maturity of the markets served. If you think about large multinational companies, their business in China is very different from their business in Thailand, which is very different from the business in Australia or the United States. Global companies will have to think much more locally about cybersecurity and data strategies."

Will deglobalization get better anytime soon? Splunk CEO Gary Steele doesn't think so. "It's going to get harder," he says. "And companies will have to get creative in how they adapt and how they rely on their vendors to get them through it."



Economic uncertainty will erode some employee gains, but in-demand talent will still be mission-driven and WFH.

The pandemic accelerated several notable trends in the human resources realm. Remote work became necessary and remains common. There has been an increased focus on wellness benefits and practices designed to ease stress during a chaotic few years. Now, many businesses are seeking a return to a certain level of normalcy as people grow weary of pandemic precautions. And recessionary fears are driving leaders to tighten purse strings and focus on value — on measurable outputs that contribute to the bottom line. But unemployment remains low, and workers still have some leverage.

Splunk Chief Strategy Officer Ammar Maraqa thinks that some of that leverage will shift back to employers, but he doesn't think we'll go back to the pre-pandemic normal.

"The remote-work taboo has been broken, and the mutual benefits of that flexibility will somewhat remain," he says. "Maybe some companies will institute more hybrid work, rather than pure remote work, and perhaps will be more cautious about the costs of benefits of traditional wellness programs." Makes sense, but unless the economy really, really goes south, steady employment rates will mean that good workers remain hard to come by, and even in an uncertain market, they'll continue to switch employers faster and more easily than in the past.

"There was a lot of discussion last year around the Great Resignation," notes EMEA GM Petra Jenner. "Now we're seeing the Great Renegotiation of



contracts. Workers are still confident about their position with employers, and they will ask for changes, or go elsewhere. This ties into the challenge of retaining our most valuable workers."

In Europe, she says, workers are concerned with an employer's environment, social and governance stance. "We're seeing a talent revolution in which younger workers in particular want to join organizations with a clear purpose and vision," she says.

Mark Woods, Splunk's chief technical advisor in EMEA, says mission-driven workers create a larger challenge for more established organizations.

"You know, it's incredibly hard to run a startup in Europe," he says. "Initial funding is really hard, for instance. But they don't have a problem with talent, because startups tend to be purpose-driven and focused from the start. Larger companies have that challenge, and their buzzword bingo around social good isn't always convincing. People will join, but leave a few months later because the stated mission hasn't truly been embraced."

"In today's transparent world, corporations must align their social and environmental statements with action to attract and retain top talent," says Kriss Deiglmeier, Splunk's chief social impact officer. "People want to work for a purposedriven company."

Part of the reason that in-demand workers can make demands of their employers, whether for wellness benefits or social relevance, is that they're in demand. And while a more severe recession would certainly lead to layoffs, key IT and security talent will always be scarce.

"No matter what economic environment emerges, that very tight labor market won't change for security or IT," notes Splunk CEO Gary Steele. As a result, companies are trying harder to throw a wide net for talent, rather than a narrow net for skills.

"The customers I talk to understand that there will never be enough higher-ed graduates to fill the jobs in the technology space," says Robert Pizzari, Splunk's VP of security in APAC. "We're seeing more creative approaches. For instance, do we really need a candidate to have these specific certifications or that four-year degree to work in cybersecurity? There's a shift instead to looking for people from different backgrounds who have a curious nature and analytical mind, which is what you really need on the front line of a SOC."

Dhiraj Goklani, VP of observability in APAC, agrees with that strategy, but notes that the problem isn't just a lack of STEM graduates. "In many Asian markets, we're seeing an aging population, meaning that there are not enough people coming into the workforce, period," he says. "So in addition to smarter recruiting, automation and artificial intelligence are potential silver bullets to much of this problem. In the observability world, so much around pattern discovery and anomaly identification can be handled with automation and machine learning."

And ML models won't ask you to explain your corporate value proposition, or demand on-site yoga classes. Yet.

Tech teams will have to train more on core principles, not just tool skills.

In 2022, a broad, even unlikely coalition of parties, from CEOs to union leaders, signed a letter **calling for states to update their K-12 curriculum** so that every student can learn computer science. As necessary as that is, private businesses will have to step up as well, and it starts with software vendors.

"Organizations need to rely on their suppliers to build the ecosystem of talent that will deliver business outcomes most effectively," says Chief Customer Officer Katie Bianchi.

"Companies like Salesforce have been innovative because they recognized the need to build an ecosystem of talent that can use their platform to power major business outcomes. The goal is not to train teams just on using the solution, but also on using the solution to achieve business outcomes."

She says another onus on the supplier is to make the product as easy to use as possible.

"We're trying to move in that direction ourselves," says Lily Lee, senior manager of security solutions strategy. "In the case of security, my team is looking at how we can make our product education more broadly applicable, so we are not just teaching you Splunk, but also how to be a better threat hunter, how to be a better tier one or tier two analyst."

This approach will build a better talent ecosystem, and make the companies that invest in such career-level training more attractive to the very talent they're trying so hard to retain in the first place.



Emerging Technologies

Every year, we take a look at the emerging technologies that our experts think have the most potential in the next few years. This year, perennial favorite AI/ML came up a lot, on its own and in conjunction with automation. While neither AI/ML nor automation are emergent as topics, they're definitely moving past the hype phase to deliver the serious value that has long been promised. And all the complexity of modern IT infrastructure makes it a timely arrival. "Applying machine learning to predicting behavior is a huge value, especially given today's shortage of IT and security talent," says Chief Customer Officer Katie Bianchi.

She says machine learning will both simplify and improve all business outcomes, from application performance to improved security detection. "In all those cases, ML provides better and more accurate insight so that we can see what's coming next and orchestrate the best response," she says.

"The need for both AI/ML and automation is really there," Chief Strategy Officer Ammar Maraqa agrees. "It's the complexity, but also the shortage of skilled IT and security talent and the increasing pressure on costs and value."

Maraqa handicaps other hot technologies as well. More established trends around cloud and edge technology will continue. "The move to cloud is always happening," he says. "People now are wrestling with the complexities of 'and.' On-prem *and* in the cloud; AWS *and* Azure."

Edge computing, he says, is another key playground for automation and machine





learning. "We need more solutions to keep the data where it is and do as much as you can there, instead of schlepping it back and forth. It's very expensive to move data. Edge and ML-driven automation fit into that need to do more before you move the data."

He's also bullish on blockchain, despite the bad press in 2022 about crypto's collapse and hacks triggered by human error. "Blockchain is going to be one of the most exciting technology areas for the next three to five years," he says. "It's about the underlying technology and its use for authentication especially in terms of contracts and supply chains."

Simon Davies, SVP and general manager of Splunk in APAC, has seen a lot of interest in one specific application of blockchain. "I've seen a lot of businesses trying to figure out Web3 and building and deploying applications on blockchain."

A number of our wonks also had thoughts on quantum computing and the metaverse, but we've put the bulk of our effort into the topics most applicable to the next few years. And through that lens, nothing compares to artificial intelligence and machine learning.

Large language models are the next transformative AI/ML technology.

While ML is going to be "in everything," there are some standout areas to watch. One, all our data science folks tell us, is large language models.

"Trying to productionize large machine learning language models is going to be a big area of focus in the next few years," says Subho Majumdar, a senior applied scientist focused on machine learning at Splunk. "We're seeing this right now with GitHub Copilot, and we'll see more cases in which vendors offer the capabilities of proprietary models that they've developed as a service to other parties. Startups are already coming up right now to do that, and I think we're going to see a lot more of them."

"The range of problems that language models can be applied to is wider than we now conceive of," says Joe Ross, who like Majumdar points to GitHub Copilot as a prime example. It's a language tool that translates plain-English descriptions of coding goals into actual code. Many security researchers and others have pointed out that Copilot doesn't produce code you'd want to ship straight into production, but it can be a good first draft. "The objective is to help engineers write code more efficiently by predicting a first version of the code they want to write," says Majumdar. "The idea is not to get to production-level code, but just to get people started."

It's also a way to extend limited human talent, if technically proficient staff who aren't quite coders can use a copilot to get started, with senior developers and quality assurance staff following up to review. However it shakes out, it's a great application of the translation tool idea that's already letting you travel with a solid language translator on your phone.

And these kinds of coder-support tools will get better. **GitHub Copilot was built** on the Microsoft-fueled OpenAI GPT-3 language-generating algorithm led to OpenAI Codex. Similarly, Google's DeepMind has developed AlphaCode, another ML model for writing computer programs, that has fared reasonably well in coding competitions. (Eventually they'll fight it out and the winner will be crowned Skynet.) When these sorts of language models aren't helping us write code or order lunch overseas, they'll be powering chatbots you can actually chat with, allowing you to literally talk to a search engine (and get meaningful results), personalizing tutoring plans, correcting your grammar, and writing basic contracts, news articles, marketing copy and reports like this.

Whether that worries you or makes you eager for tomorrow, this talking computer future won't be here overnight.

"One characteristic of these large language models is that it's kinda impossible for most organizations, whether in academic or industrial spaces, to train one on their own," Joe Ross says. It's hard to get the right data set, hard to curate and prepare the data, and then the human supervision and raw compute costs of developing the model are expensive. "This sort of thing can't really be done in most places, but it is possible to extract a model as an artifact and then build applications on top of that."

That's the next horizon, machine learning models as a service, and we're almost there. "That combination of an ML model and (a sample of) the curated and prepared data set is now commonly packaged as one thing," Ross says. "The result is closer to a finished product, something that a relatively smaller engineering team can then tinker with."

The result of essentially democratizing large language models will be hugely influential, Ross says. "People will be able to interact with systems more in English and not have to deal with underlying complexities," he says. "Spoken to written language is a solved problem. Translating speech or text directly into action, without having to actually do it yourself, is the next horizon, and we'll see that in maybe three to five years."

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Increased concerns about ethical AI will affect how ML is trained and maintained — and create new roles to do it.

Our third look at the increasing pervasiveness of machine learning is in terms of evolving ethical practices. Stories of unintended bias discovered in ML models regularly emerge. Fortunately, ML Ops practices will bring more standardization and transparency, making it easier to assess models for fairness and to maintain and retrain to prevent biases from creeping in.

For more, we turned to Subho Majumdar who may not have written *the* book on ML ethics, but he certainly co-wrote *a* book on the topic (**Practicing Trustworthy Machine** Learning, just published by O'Reilly). Majumdar is active with multiple community efforts — Trustworthy ML initiative, Bias Buccaneers, and AI Vulnerability Database — which are looking to guide and educate ML practitioners to develop ML models that are fair, safe, robust, explainable and that preserve privacy. Majumdar says that transparency, a necessary prerequisite of fairness and other values, is increasingly important.

"Trustworthy ML involves operationalizing ML while incorporating human values into your ML pipeline," he says. "The goal is to build trustworthy ML pipelines from the beginning, so you don't face biases and other problems in your outputs after the models are deployed in the real world." Joe Ross points to model cards, which provide brief documentation about an ML model that increases transparency into the model and its outputs. A card would describe a model's uses and limitations, review bias and ethical considerations, and detail the data and methods used to train the model.

"And we're seeking work at HuggingFace and other repositories to ensure that we can understand the lineage of a model," he says. "This moves us toward being able to make scientific demonstrations of bias in the model as part of a standard review process that checks for a list of known biases."

Bias checklists, he says, could become a standard part of ML quality assurance, both when the model rolls out and over time, as additional data potentially alters its outputs.

In addition to new processes, concern with AI ethics will also create new jobs. Majumdar foresees specific team roles for an AI ethicist, and for a prompts engineer, who would focus on how prompts not only influence the accuracy of the model's outputs, but its potential biases.

"As a community, we're progressing toward providing transparency to whomever the stakeholder is," Majumdar says. "If it's the government, that would mean transparently abiding by any regulations and compliance guidelines. If the stakeholder is the consumer, there needs to be a way to file a ticket or a complaint about any concerns on algorithmic decision making. There is already an **AI Incident Database**, which tracks things that went wrong with deployed AI/ML models. It's kind of like the CDC's vaccine effectiveness database, where you can submit any problem that occurred because of a vaccination. This is a complicated area, so it will take a few years for the ML community to figure things out. But I do think we are going to see more standards and best practices on trust and transparency in ML.

"Regulation is always behind the cutting edge technologies, whether you're talking about blockchain, ML, even ecommerce," Mangesh Pimpalkhare says. And he's hopeful that some of the worst outcomes we've seen to date around data privacy and technologies such as social media will provide learnings to shape the next wave of technology. "The wildness of tech will continue, but it won't take as long to reach a responsible endpoint. It's in the industry's best interest to establish effective self regulation ahead of lawmakers. You see some of that now, with self-declarative responsible AI initiatives."

Kriss Deiglmeier, who leads Splunk's global impact initiative, agrees that regulation isn't an immediate answer, and that the public won't be content to wait. "Al and data ethics are becoming more important to business, and in the short term it will be the responsibility of business to make their own progress," she says. "Regulation will follow, but it'll likely be different in each country or region."



Prediction In a few years, NFTs will secure ownership and identity.

The big blockchain story of 2021 was the explosion of NFTs in the art and entertainment world, with NFTs — non-fungible tokens, a blockchain-based proof of authenticity — for digital art (and, inexplicably, the first tweet) selling for astronomical sums. By 2022, NFTs weren't drawing as many headlines, and those in the mainstream media were unkind. (September CNN headline: "No one seems to want NFTs anymore. Here's why.")

But don't count NFTs out. The technology will soon underlie a lot more than digital art.

"Eventually," Tom Martin says, "everything from your degrees and certifications to your titles for your car and your house, to your in-video-game items, will be represented with NFTs."

So what was with an "authentic copy" of Jack Dorsey's first tweet selling for nearly three million bucks?

"It's the hype cycle," Martin says. "Cryptocurrency was hugely hyped, and it crashed pretty heavily in 2022, but underneath all that, decentralized finance is emerging to bring real value from blockchain. NFTs have finished their first hype round, but the technological applications will continue to develop, and they'll be significant."

It'll be another few years until we start seeing widespread NFT-based digital ownership and representation of physical items, Martin says. But if you want to bid on an NFTauthenticated version of this very report, we're sure we can work something out.



Blockchain hacks will continue, but as is often the case in security, it's not the tech, it's the humanity.

Blockchain hacks are already happening. Last summer, a massive hack of crypto token Solana captured headlines, reportedly costing thousands of users a total north of \$4.5 million dollars. In the same month, a **CNBC report** put cryptocurrency theft in the first half of 2022 at \$1.9 billion. But wait, blockchain is unhackable, right?

No perfect technology is unhackable when it's administered by inevitably imperfect humans. The Solana hack was attributed to embarrassingly negligent security controls, not some deeply buried software flaw. It was the digital equivalent of burglars getting in your house because they had the key to the front door. The Nomad attack reportedly exploited a flawed update to a smart contract that compromised a blockchain bridge, which enables transfers from one cryptocurrency chain to another. "I think that some of the biggest financial impacts in terms of cyberspace breaches will be in the blockchain space," says Patrick Coughlin, vice president of GTM strategy and specialization. "All these headline-grabbing hacks are just the start."

"The job of blockchain is to be decentralized and traceable," says Tom Martin, principal solutions engineer for blockchain and digital ledger technology at Splunk. "That doesn't mean



it's immune from coding errors. In fact, when you look at these incidents, the transactions that took place were legitimate from the system's perspective, based on the parameters that had been programmed. The system worked exactly as intended and fortunately, for the aftermath, it kept a perfect record of everything that happened."

"Even with the crypto crash last year, so much money is moving through these blockchain networks — yet so much of it is still the Wild West,' says Coughlin, whose deep security background includes cofounding threat-intelligence startup TruSTAR. "These incidents force us to think about how blockchain is different in terms of resilience. How does blockchain fit into the definition of cyber resilience? How can we apply similar people/process/technology lessons we've learned over the last 20 years to defend these digital networks? That's an exciting challenge that will come with a lot of pain and pioneer tax as we learn from past mistakes and blaze new ground."

And a lot of financial reward for bad guys until the industry gets it right.



Fully digital agreements will drastically increase efficiency and ultimately will unlock new products and services.

In the early days of the internet, we replicated analog services in a digital space. Newspapers posted digital versions of the copy that ran through their presses. Netflix let you order by mail the DVD you could drive over to Blockbuster to rent. It's still common these days to either scan a paper contract and its ink signature, or sign an agreement digitally through services that verify an "electronic signature."

But today, a newspaper article may contain complex, interactive data visualizations that are impossible in print, or it may include audio or video components. Rather than request physical media, we stream whole seasons of TV in a weekend. We rent access to music libraries rather than purchase music on discs.

Just as we've seen new paradigms in how we consume and share, we're on the edge of a massive transformation in how we make and verify binding agreements. Thanks to distributed ledger technology (DLT), in which a ledger is distributed among many entities rather than existing as a single instance controlled by a single entity resulting in agreements that are more efficient and more trustworthy. No more easy-to-forge, cumbersome-to-verify ink signatures. No more storing digital documents in a single, easily modified database. "The entire world operates via agreements in the form of contracts, which are massively inefficient and error prone," says Tom Martin, principal solutions engineer for blockchain and digital ledger technology at Splunk. "Fully digital agreements will become dominant, massively increasing the speed of business."

With ATM cards in our wallets and banking apps on our phones, it's hard to believe that access to banking services used to be limited to six or eight hours per day, five or six days a week, if you could make it to your nearest branch. Today's children will grow up unable to believe that ink signatures were used for verification, and that it took weeks to close the sale of items such as buying a home.



"We've acclimated to inefficiency to such a degree already that we don't realize how much better it can still be," Martin says. "Once you understand smart contracts, you see all the inefficiency and realize that it's all ripe for change."

The result will be new ways to recognize, secure and exchange value. Decentralized finance, or DeFi, is a significant innovation that is already well-established.

Smart contracting and digital assets will combine to produce a profound shift — already underway — in the idea of value. Today you might invest value in the form of paper money or a physical asset like gold by depositing it in a bank and earning interest. Or you can invest it in a stock that may appreciate in value as the company performs well. You could also have value in the form of a cryptocurrency that changes in value in the open market. You might convert some of that value to buy unique digital items in a video game, and if those items increase in value, you might sell them for a hefty profit and pay your rent with the proceeds. Try explaining that to your grandfather.

"New products and services are emerging," Martin says. "How we store and transfer value is changing, and unique digital assets are coming into existence, all enabled by blockchain technology. We're at the cusp of a change in the concepts of ownership and validation that will be revolutionary."



Prediction The metaverse is a long way out. But it's not too soon to think about the data.

A virtual reality metaverse where we all live somewhere between kaleidoscopic *Ready Player One* adventure and monochromatic *Matrix* misery is a long way out, but it's too much fun to think about. For starters, there's the underlying technologies, which are coming to fruition even before a full *Snow Crash* reality arrives.

"I'm very bullish on AR, which we're seeing in the world already," says Chief Strategy Officer Ammar Maraqa. "You map your driving route. Field techs use AR glasses or iPad apps to overlay data on the equipment they repair. That's the short-term value of AR: Applying data to make human lives easier. I don't have to be a programmer to route myself around a traffic jam or get information served up to me on a historic building I am looking at."

The IKEA app that **lets you see** what a white sofa would look like in that corner of your living room is really cool, and Amazon has one that lets you see **how a pair of shoes would look** on your feet, but when will we just cut to the chase and furnish virtual apartments to lounge around in our virtual outfits?

"VR is further out, with gaming as the leading edge," Maraqa says. "We'll see it in military training, and in pilot training. It's being used in medical training already, but it's still clunky. There is a lot of investment happening in this area by the major tech firms, but they are still inventing the building blocks."

The interest is there, though, especially among companies in Asia.

"We talk to a lot of companies that really want to improve customer experience, and the forward-thinking ones see VR as a way to do that," says Dhiraj Goklani, APAC VP of observability. "There are several startups in this part of the world who are building apps for the metaverse. It's still early days, but I think we'll see a lot more."

Our APAC team expects youth culture in South Korea, K-pop artists in particular, to drive interest in virtual reality, especially around entertainment and esports. And though the full metaverse experience is years away, it's never too soon to start thinking about the data challenges.

"AR/VR will drive the creation of more data for insights," says Katie Bianchi, Splunk's chief customer officer. "Think of how much data we generate just interacting with flat screens. Immersive virtual reality experiences will generate exponentially more data that organizations will have to manage and understand. It will be another challenge of complexity and scale."

She points not only to the raw amount of data that any metaverse application will generate, but the networking challenges, the analytics challenges, the privacy, security and observability concerns. A lot of change will have to happen, and it won't arrive all at once.

Bianchi's advice: Never stop evolving data capabilities. As soon as you've solved a data problem, you'll be up against a new challenge.

Quantum computing is not a near-term thing, but it will be hugely transformative. In ways few can imagine.



Quantum computing is another far-horizon big deal, involving using quantum mechanics to solve problems that standard computers can't handle. But few organizations can even begin to work with the developing technology.

"Quantum computing is inherently cost-prohibitive today," says John Reed, principal product manager at Splunk specializing in Al. "The amount of physical support infrastructure needed to get that computer cooled to nearly zero kelvin is not approachable for most organizations, which leaves cloud companies like Google, Amazon and IBM to try to create it as a service, but there are barriers there, too."

"And people haven't figured out the programming model for quantum computers," adds Mangesh Pimpalkhare, vice president of product management for the Splunk platform. "We're far from bridging the gap between the math for neural network based machine models and the algorithms that work for quantum computers."

What's not a long way off is worrying about the impacts of this new technology. **American Scientist notes** that quantum

computers could eventually have enough power to "break most modern cryptography. The effect would be to render communications as insecure as if they weren't encoded at all."

"Cybersecurity as we know it today is dependent on cryptography, and quantum computing will completely upend that," says Robert Pizzari, VP of security for APAC.

Work is already being done: The Biden Administration issued executive orders in May, and Congress passed legislation in August, to pursue quantum technology. And NIST, concerned specifically with the encryption issues, is **already at work** on post-quantum cryptographic standards.

While we won't see the full arrival of quantum computing for some time, expect the technology to usher in big changes in the next five years.

Better Data, Better Tech, Better Tomorrow

Even before we dive head-first into the Matrix, digital experience has become central to how we live and what we need to thrive.

"The pandemic fundamentally changed the way people live their lives and interact with each other," says Katie Bianchi. "Even well past the lockdowns and mask mandates, we're still much more digital in the way we live and work. That trend will continue."



Making progress through turbulent times requires resilience, she adds. Digital resilience means the ability to prevent, observe and quickly remediate security and performance incidents. That requires not only a holistic approach to data, but technology.

"Given ongoing talent shortages," she says, "automation enables you to scale domain expertise."

On the security side, Patrick Coughlin, who has led cybersecurity teams for government and private sector organizations, sees it happening already. "The technologies that matter in protecting cyber resilience are converging, and the organizational structure and silos are coming together," he says. "Data has been converging for a decade. I think we're entering a golden age, a turnaround in how we think about cybersecurity talent and resources."

What really defines a golden age is not just its technology or resources, but the good outcomes those resources enable. In addition to driving the efficiency and resilience of digital businesses, the technologies discussed in this report, and others, will be used to tackle challenges around health, safety and climate.

There's real momentum, says Chief Social Impact Officer Kriss Deiglmeier. She notes younger workers' insistence that companies stand for something more than pure profit.

"Young people are deciding where to work based on more than the paycheck," she says. "They see caring for the community as valuable, and of course mitigating climate change and economic inequalities is better for business, for resilience, for everyone."

This, she says, leads into the next phase of capitalism, which will incorporate company stakeholders into decisions — a "smart capitalism" in which every stakeholder and priority, including but not limited to the bottom line, is taken care of. If that sounds a little like tailgate talk outside a Grateful Dead show, remember that in 2019, the influential Business Roundtable redefined the purpose of a corporation from enriching shareholders to benefit all stakeholders, including **customers, employees, suppliers, communities and shareholders**.

"Data will drive all these outcomes, business, environmental and social," Deiglmeier adds. "There is not one corporate development goal that data is not relevant to."





Contributors



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Katie is Splunk's senior vice president and chief customer officer. Previously, she was vice president of customer success at GE Digital, and has held leadership roles in product management, business development, services, marketing and operations across industries, including aviation, power generation, and oil and gas.



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Dhiraj is Splunk's vice president of observability in APAC, where he applies more than two decades of experience in the tech industry to helping grow the observability market in the region.



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Patrick, Splunk's VP of GTM strategy and specialization, comes from a deep security background. He was co-founder and CEO of TruSTAR, a cyber intelligence management platform acquired by Splunk. Previously, he led cybersecurity and counterterrorism analyst teams for the U.S. government and private sector clients.



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Kriss is Splunk's chief of social impact and Splunk Global Impact. She is recognized as a social innovator, is a frequent speaker at global events, and was recently listed among the "50 Most Influential Women in U.S. Philanthropy" by Inside Philanthropy.



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Ammar is Splunk's senior vice president and chief strategy officer. Back in the day, he led corporate strategy at Cisco, was part of the M&A team there, held product roles at Dell, and started his career as a consultant with Bain & Co.



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John is a Principal Product Manager at Splunk. His responsibility includes the strategy and execution of initiatives across Machine Learning and Core Search. Previously, John was a product manager at AWS, where he worked across the AI/ML service portfolio.



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Joe is senior principal applied scientist at Splunk. Before joining Splunk, he worked in senior data scientist roles at SignalFx (before it was acquired by Splunk) and Ayasdi. He has a background in mathematics, and has publications in pure math and statistics.



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Mangesh is vice president of product management for Splunk Platform. As a product executive, he has had more than 15 years of operating experience and more than eight years of venture capital experience in diverse software (SaaS), systems and technology companies.



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Gary is the president and CEO of Splunk and a member of our board of directors. Prior to joining Splunk in 2022, Gary was the founding CEO of Proofpoint, where he led the company's growth from an early-stage start-up to a leading, publicly traded security-as-a-service provider.



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For more 2023 predictions, see the IT/observability, public sector and data security reports.

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