

The background of the slide features a close-up of a hand typing on a black keyboard. The scene is lit with a mix of cool blue and warm pink/purple tones. In the upper right, there are out-of-focus circular light patterns (bokeh). Overlaid on the image are several semi-transparent geometric shapes, including rectangles and triangles, in shades of pink, purple, and orange, creating a layered, digital effect. A thick diagonal line in orange and pink runs from the bottom left towards the top right.

The Five Forces **Building the Next Data Wave**

How transformative
technologies are accelerating a
Data-to-Everything world

The Data Wave

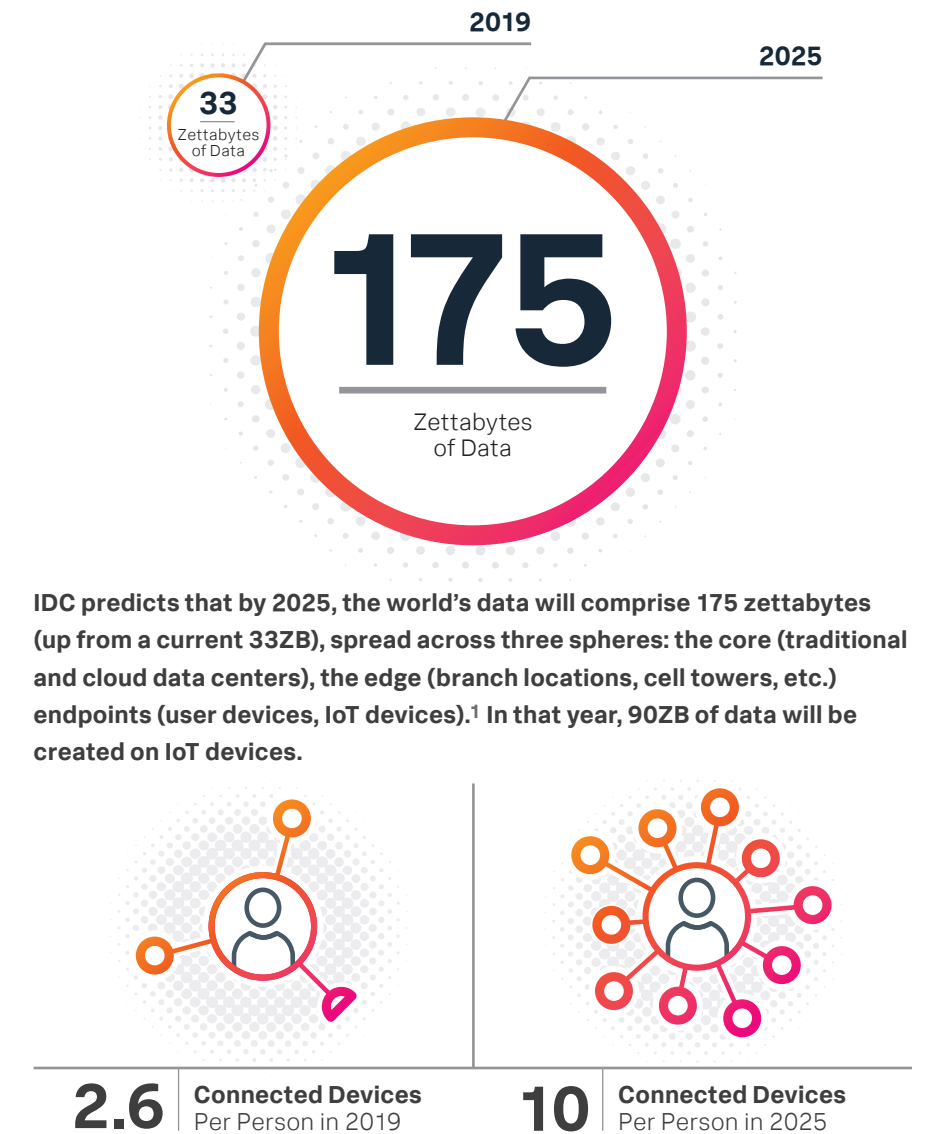
“These days, most serious business plans are built on data, and most data strategies are intricately linked to business goals. It’s time to stop thinking about the two separately.”

— Forbes, April 18, 2019

Technology has been changing the world since the wheel. But the acceleration that began with the Industrial Revolution has increased tremendously in the digital era. The pace of change in the first two decades of the 21st century has been breathtaking.

Over the past decade, the world has increasingly understood the impact of intelligently leveraged data. Tackling the biggest challenges — improving healthcare and education, stewarding the climate and natural resources, fighting poverty, protecting privacy and managing the huge global population — will depend on effectively understanding and acting on data.

While the message of constant change has been a familiar refrain since the dawn of the commercial internet, we are on the cusp of a significant increase in the rate of data creation and utilization. We are at the advent of new disruptions, new threats and new opportunities. Just as the union of 4G telecommunications and the smartphone unleashed dramatic changes in business and daily life, five intensifying forces are combining to bring a new level of transformation, and a powerful wave of opportunity for both global society and the well-prepared organization. A data wave.



IDC also estimates that there will be 80 billion connected devices by 2025.² That will average out to 10 gizmos per human. Currently, there are more than 22 billion connected devices worldwide,³ and Quartz reported as far back as 2017 that more than 70% of internet traffic comes from mobile devices.⁴

¹ NetworkWorld, “IDC: Expect 175 zettabytes of data worldwide by 2025,” Dec. 23, 2018
² IDC Report, “Data Age 2025,” 2017
³ Help Net Security, “Number of connected devices reached 22 billion, where is the revenue?” May 23, 2019
⁴ Quartz, “The Mobile Internet is the Internet,” Oct. 31, 2017

The Five Forces That Define the Data Wave

Let's start by looking at the five major forces accelerating data-driven change: 5G telecommunications, artificial intelligence (AI) and machine learning (ML), the internet of things (IoT) and edge computing, blockchain and, finally, consumer expectations, in a world where everything is on demand and in real time.



1 5G Telecommunications

5G, the next generation of mobile voice and data telecommunication, is not just about speed — it's about quality of service and greater geographic reach. 5G will rewrite concepts of speed, capacity and entire connected experiences, including applications of the internet of things and virtual and augmented reality. With 5G, those trends will accelerate, and we'll see mainstream applications of virtual and augmented reality and new digital business models yet to be realized. Everything from [haptic-feedback internet experiences to remote surgery](#).

“On a trip to Oulu, Finland, where there’s a 5G development center, we attended a 5G hackathon. The top ideas included a game streaming service; a way to do stroke rehab through VR; smart bandages that track your healing; and a way for parents to interact with babies who are stuck in incubators. All of these ideas need either the high bandwidth, low latency, or low-power-low-cost aspects of 5G.”

— PC Mag, 2019

Among the new services expected from 5G carriers are more robust edge computing and machine-to-machine communications, both of which are essential to serve the billions of connected devices and whole future industries such as driverless cars. Other fields expected to benefit from new, 5G-driven applications and business models include telemedicine, shipping and logistics, wearable devices and agriculture. Though true 5G will arrive slowly and unevenly over the next several years, telcos are beginning to market nascent 5G offerings that lay the foundation for a massive global rollout of this next-gen communication infrastructure.



2 Artificial Intelligence and Machine Learning

Artificial intelligence is the ability of machines to observe, think and react to inputs. It's based on the idea that human intelligence can be broken down into precise abilities which computers can be programmed to mimic. AI is an umbrella term that encompasses a wide range of concepts and technologies, including machine learning.

Researchers used AI to more quickly and accurately assess the [lasting damage of Hurricane Maria](#) in Puerto Rico. Hollywood studios are using it [to decide which films to greenlight](#). PwC has used AI [to develop a model of lifetime purchase decisions](#) for 320 million U.S. consumers, which it markets to the financial services industry. The U.K. is using AI to work out strategies [to mitigate the effects of climate change](#). And of course AI, particularly the machine learning subset of deep learning, is central to the concept of autonomous vehicles.

The widespread adoption of AI will create tools to draw previously undiscoverable insights from our enormous stores of data, helping individuals work smarter and ask better questions. It will let organizations respond to opportunity and disruption more quickly, and discover unexpected innovation.

“There’s nothing that AI won’t impact. So, having been around awhile, I saw the impact of PCs. Then I saw the impact [of] the local area networks. Then I saw the impact of wide area networks. Then I saw the impact of the internet. Then I saw the impact of mobile. Then I saw the impact of wireless. Now I’m seeing the impact of artificial intelligence. And it dwarfs any of those things.”

— Mark Cuban, June 2019

3 The Internet of Things and Edge Computing

The internet of things has been a thing for at least a decade, as more and more smart devices connect in industrial settings, transportation networks, hospitals, factories, stores, offices and homes. It isn't slowing down, either: IDC predicts that [worldwide spending on IoT will hit \\$1.2 trillion](#) by 2022. The increasing use of data-generating sensors and the ability to push computing to the edge add a new dimension of data and potential connectivity.

The number of IoT devices that are active is expected to grow to 10 billion by 2020 and 22 billion by 2025.

— State of the IoT 2018, IoT Analytics, August 2018

Next-level developments in IoT and edge computing will capitalize on the growth of cloud technology, one of the leading drivers in the most recent wave of digital transformation. Data can exist anywhere now, and computation can happen anywhere. Edge computing allows automated processes to execute in the field, rather than from a central headquarters. This development will provide greater speed, efficiency and economy to the growing array of sensors and smart devices comprising the internet of things. Power grids, oil rigs and video distributors are already employing edge computing solutions.

4 Blockchain

Blockchain is a decentralized, distributed electronic database shared across a public or private network, sometimes referred to as decentralized ledger technology (DLT). Every transaction in a blockchain database is shared among a number of users, each one verifying that the database is accurate and preventing unauthorized transactions from being completed.

Though blockchain most famously underlies digital currencies, decentralized ledgers will reach far beyond Bitcoin, Ethereum and the rest. Blockchain will help solve one of the biggest challenges in a fast-moving world of data, devices and decisions: trust. Blockchain [creates a highly tamper-resistant chronology of transactions](#), viewable by all. The technology has been most famously used in cryptocurrencies, but other prominent examples are extant: Target is investing in blockchain to manage its supply chain; Walmart is applying blockchain to food supply safety; both Amazon and Salesforce are offering blockchain tools to their customers. In June 2019, Facebook announced the formation of a consortium to create a [blockchain-driven payment system called Libra](#). The consortium includes Mastercard, Uber, eBay, Spotify, multiple investment firms, and several global humanitarian nonprofits.

The question for executives is no longer, “Will blockchain work?” but, “How can we make blockchain work for us?”

— Deloitte’s 2019 Global Blockchain Survey

In the wake of a 2018 E. coli outbreak, Walmart announced its farm suppliers would [upload food data via blockchain](#) to make it easier to determine food safety. Both trusting and securing data become more vital challenges in this accelerated data age, and blockchain will be a forceful technology.

Higher trust in data integrity will increase efficiencies, enhance security and upend business models.



5 Consumer Sophistication

The final force is not a tech category. It’s the human factor. The previous wave of digital transformation, particularly in the consumer space, has raised all of our expectations around connectivity, convenience and responsiveness. It has shortened attention spans and our tolerance of frustrating user experience. These trends will increase as young digital natives continue to enter the workforce.

An example of rising consumer sophistication is in healthcare, where patients no longer passively wait for doctors to diagnose illnesses or order tests. Genetic testing is now commercially available directly to consumers, who take their own samples and mail them directly to the labs.

Not only can data and data-fueled technologies make the technology experience better, your users demand it of you. Data should drive all decisions and digital experiences, easily and naturally. The proliferation of technologies and data we’re describing here as a data wave requires that user experience be refined and curated for maximum clarity and convenience in what could otherwise be a cacophony of information and options.



Data Drives **Success**

In summary, these five trends affect more than, say, how you design your online customer experience or how much extra data can be fed into your business intelligence dashboard. These trends redefine how a business pursues success.

In the past, you usurped incumbents by fundamentally improving on a **core product or technology**, as Google did with search, and Apple did with phones. These product launches came infrequently, as big bangs that reshaped their marketplaces for years to come, until the next significant, R&D-based disruption. In the future, success will not wait for these milestone innovations in a core product.

Instead, data will drive meaningful innovations, strategies and efficiencies. We see examples already: Think of the improved digital experience that decreases cart abandonment for an online retailer. Consider the insurance industry, which is tying health and auto policies to trackers on our wrists and in our cars. Think of transportation companies using sensor data from trucks and train cars to improve logistics. Look at industrial manufacturers adding sensors to jet engines, tractors and more to facilitate predictive maintenance and improve uptime and safety.

Incumbents are already seizing the day. Amid the rise of new digital disruptors like Airbnb, Netflix, et. al., giants like Google, Microsoft, Facebook, Baidu and Alibaba are cornering data science talent and investing in cutting-edge fields like AI, robotics, quantum computing and more. Forward-thinking organizations have to understand the technologies that are coming, and work to make the most of the data that will drive them.



“The twin turbines of AI and big data could account for approximately 40% of the \$1.7 trillion that companies worldwide are forecast to spend on digital transformation initiatives in 2019. And that’s only the beginning.”

— Seven Forces Reshaping Enterprise Software, Boston Consulting Group, March 22, 2019

Catch the Data Wave

Many organizations today still struggle with their initial digital transformations, and risk being overwhelmed by greater and faster change. [Our research into the state of dark data](#) found that many organizations are not merely underusing their data, but often are ignoring — or are unaware of — vast quantities of their data. Forward-thinking organizations need to understand both this next wave of transformative forces and how their own approach to data prepares them to succeed in the next digital era.

AI is not a toaster. It's not something you pull off a retail shelf, plug in and put to work. The process of adopting AI, or any data-driven technology, begins long before you "plug it in." The first step is making sure your data, and your organization, are ready to enable these new technologies. If most of your data is dark — untapped, unused, unknown — your analytics tools won't be able to produce an accurate forecast. Take care of siloed and unsecured data, make sure it's ready for a world in which all data sets can be combined and interrogated for new insights.

Dark data is all the unknown, untapped data across your company, generated by systems, devices and interactions. Globally, 60% of business and IT leaders report that half or more of their organization's data is dark.

— Splunk, [The State of Dark Data Report, 2019](#)

The first step is for organizations to define a strategic approach to their data systems. That doesn't mean every data point is neatly structured in a rigid database. Chaos must — will — persist. But the successful organization will know how to navigate that chaos, the way a well-piloted ship navigates the vast, churning ocean.

Preparing without predicting

There's no way to prepare for exactly the future that will emerge. You cannot know which exact technologies will be essential to your organization's success in five years. The best of them probably haven't been invented yet. But they will run on data, and the information you're gathering today will feed those future tools. Approach your data from a platform perspective, making sure it's appropriately accessible across your organization.

Broadly speaking, there are three questions you'll always need to ask your data:

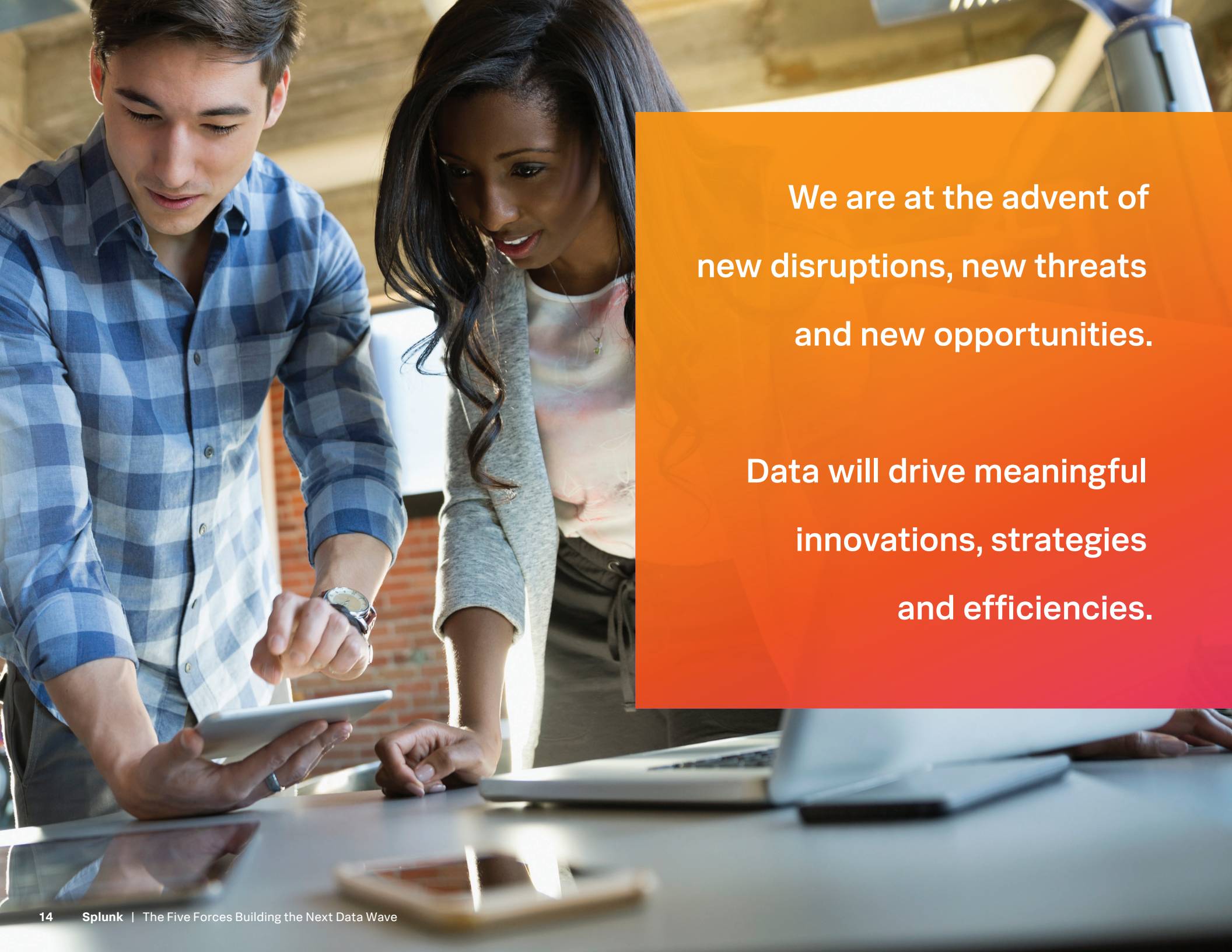
- 1. What's happening right now, in and around my organization?**
Every organization exists in a constantly shifting, constantly growing continuum of real-time data, making it very difficult to see a clear picture of what's happening. The data you can't access and investigate skews your perception of where your business is — and where it's going.
- 2. How do I turn data into action?**
Once you know where your business is right now, in this moment, you have to take action to move it toward a positive goal. That comprehensive data continuum next requires tools that surface deep, new insights and let you take intelligent action. Predictive analytics can help you see the best future, and automation can help you seize the moment.
- 3. How do I build for the future?**
A fast-moving, complex future requires an agnostic platform approach. Best-in-class point solutions often create best-in-class data siloes. You need an open approach to data, in which this key asset is secure and well-managed, but available to all the right tools. And alongside this technology, you must actively work to create a culture around data, building a [workforce instilled with the skills, curiosity and resilience](#) to embrace the future.

This approach to managing your data prepares you to take advantage of the technologies that will propel your organization to new success in an increasingly faster-paced, ever-more-demanding marketplace.

Four principles for data success

So much data — so many sources and applications and people that create and use data — is always going to be chaotic. But these four principles can define an approach to data that lets you turn chaos into an ally, rather than a hindrance:

- 1. Keep all your data in the light.**
Dark data is a threat to success today, and in the face of tomorrow's increasing demands around data. When [research shows](#) that globally, more than half of an organization's data is unused or flat-out lost, we have a problem. You need to know where your data is, what it is, and how to get at it when you need it.
- 2. Make sure you can investigate your data.**
What good is knowing where your data is, if you can't ask it business-changing questions? Data may live in structured databases, standalone applications and disordered data lakes, but it can't be locked in siloes or unreadable formats.
- 3. Deputize everyone to use data — liberally.**
Investigating data cannot be the province of a small and very overworked cadre of advanced data scientists. Empower your workforce on both the business and IT sides to work with data. That means increasing data literacy in your organization, improving collaboration, and deploying common tools that facilitate pursuit of deep insights and smarter decisions.
- 4. Speed it all up.**
You need to be able to make faster decisions. You have to be able to get from data ingestion to investigation, insight and action as quickly as possible. Look to put infrastructure and processes in place that let your organization be agile and innovative in all data-driven initiatives.



**We are at the advent of
new disruptions, new threats
and new opportunities.**

**Data will drive meaningful
innovations, strategies
and efficiencies.**

What's the point? Here's a strange note to end on:

**It's not about
the data.**



Really, it isn't. Data is a crucial business asset, but so is cash. The point of cash in a business is how you invest it. Similarly, the value of data is in what you do with it. Data must be turned into action. You have to get data out of the databases and dashboards and deliver it to every decision, every process, every move your organization makes. An original sin of the first wave of digital transformation was the data silo, and we've spent years breaking down those siloes to get our data, metaphorically speaking, into one place. The next step is to bring that data to everything we do.

Learn more about how to turn data into action:

- | Graphic: [What Does a Data-to-Everything Strategy Look Like?](#)
- | Whitepaper: [Inside the Splunk Data-to-Everything Platform](#)

Splunk is the world's first Data-to-Everything Platform. We remove the barriers between data and action to empower IT, security, IoT and business operations teams to get a complete view of their business in real time, turn data into business outcomes, and embrace technologies that prepare them for a data-driven future.



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