



The

Data Age Is Here.

Are You Ready?

Survey of more than 2,200 global business and IT leaders shows how organizations can leverage the technologies driving a data revolution.

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Introduction

Roughly a quarter-century of digital transformation has gotten us here: to the advent of the Data Age. Electronic data has been crucial since the dawn of the digital era, from dial-up modems and the first ecommerce websites to the explosive growth of cloud services and the initial insights gleaned from big data analytics.

Over the decades representing the initial era of digital transformation, organizations first adapted to new channels, and then to a data-driven era. We've seen the rise of cloud technology as we learned that all data didn't need to be locked on-premises. We saw the rise of analytics as big data became the rage. Broadband, WiFi and 4G technologies made it easier to move and access data at high speeds and in large quantities.

But in a decade since big data became a mainstream topic, there has been more promise than achievement, more challenge than realized opportunity. Companies have been "going digital" and trying to manage ever-growing, ever-accelerating data flows for at least a decade. Six technologies — 5G, the Internet of Things (IoT), artificial intelligence/ machine learning (AI/ML), augmented and virtual reality (AR/VR), blockchain, and edge computing — are now emerging as drivers of this evolution. But in the fitful transition from legacy systems, most companies have not yet built the systems or structures that can handle the sheer volume and unguessed potential of data. Even digital-native companies have difficulty answering

simple questions about their business and taking effective action.

Major retailers still struggle to know who their customers are, and what they might want next. Healthcare systems struggle to contain costs while improving patient outcomes and maintaining privacy and security. Manufacturers struggle to optimize yield, improve productivity, and find the best ways to improve supply-line efficiency.

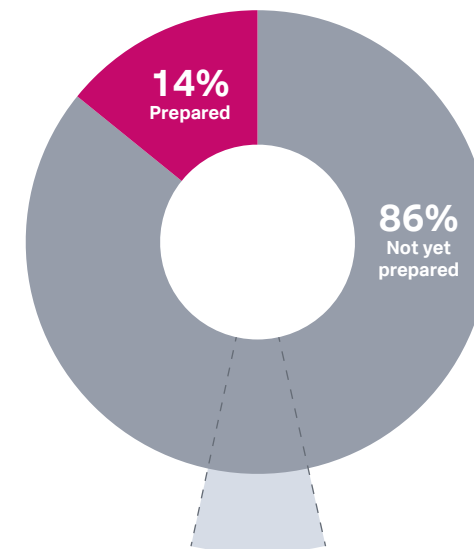
Going forward, the ability to use data to optimize performance, improve service delivery and identify new market opportunities will continue to be an essential competitive differentiator in every industry. Additionally, new technologies will provide new waves of data to manage — and mine for value — even as they allow us to offer new products, services and experiences.

The pieces have been moving into place: tools and techniques, strategies and skill sets. The COVID-19 pandemic has exemplified the power technology has to move and support economies, workforces and health outcomes. The world is faster and smarter. Real-time data informs real-time decisions, from customer recommendation engines to loan approvals to research into new medical therapies, outcomes are led by the swift, sure application of data.

To thrive in this new age, every organization needs a complete view of its data — real-time insight with the ability to take real-time action.

This report focuses on the challenges and opportunities organizations must prepare for to succeed in the Data Age. Our survey of 2,259 data-focused IT and business managers, and qualitative interviews with senior technology executives, indicates that organizations' ongoing struggle with the sheer volume of their data is likely to only become more pronounced as Data Age technologies take hold.

Preparation for the coming data wave



Among those whose organizations are not prepared for the data wave, only 8% are very confident that they will prepare in time

Key Findings

The most significant finding of this report is that the majority of organizations are not prepared for an influx of data on the scale promised by the dawning Data Age. Among the IT and business managers we surveyed, only 14% report that their organization is currently prepared for an imminent wave of new data, whether as projected from their current rate of data growth or as caused by adoption of new

technologies. Another 33% report that their organization is currently preparing for fast-rising data volumes. That leaves 53% whose organizations are not prepared or preparing at all. What's more, among the 86% whose organizations are not yet prepared, just 8% are very confident that their organization will prepare in time.

Degrees of preparedness for the Data Age



Other key findings break into three broad categories:

1. Business and IT managers know data is an asset, but most are struggling to keep up with it.

- Fully two-thirds say both the value and amount of data in their organizations will increase — expecting the sheer quantity to grow nearly 5x by 2025.
- Data is seen as inherently valuable. Strong majorities of IT and business leaders recognize that data is extremely or very valuable to their organization's overall success (81% agree), innovation (75%) and cybersecurity (78%).
- Much of this value has yet to be captured. Sixty-six percent of IT and business managers report half or more of their organization's data is dark data — the unquantified and untapped data generated by systems, devices and interactions. This is a 10% increase over the previous year. The leading challenge to discovering and accessing dark data is the sheer volume of data.
- Already, 57% say the volume of data is growing faster than their organization's ability to keep up with it, and 47% bluntly say that their organization will fall behind when faced with rapid data volume growth.

2. Managers expect that their organizations will embrace the new wave of Data Age technologies, but understanding and tactical preparedness are lacking.

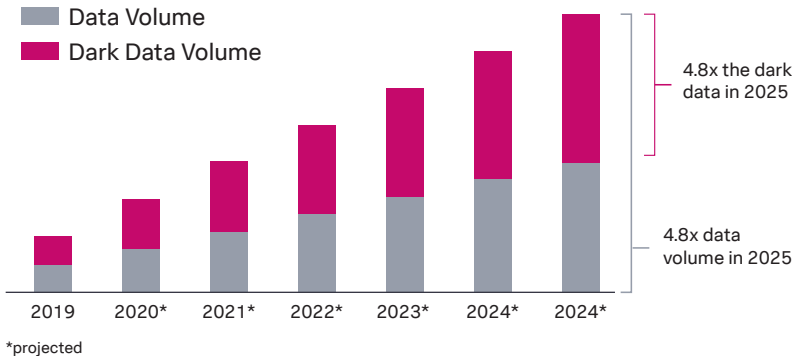
- Fewer than half of IT and business managers say they have an expert or high understanding of any of these technologies. Across all six technologies on average, just 42% of IT and business managers feel they have high levels of understanding.
- Smaller still is the proportion of IT and business managers reporting that their organizations are currently using any of these six technologies. The most mature technology in terms of current adoption, IoT, is only used by 28% of our respondents' organizations.
- Despite low levels of expert understanding, and despite less than 30% current adoption of any of these emerging technologies, IT and business managers have faith in the future of these technologies. Across all six emerging technologies, half (49%) of IT and business managers expect to use these technologies in the future.

Key Findings

3. There are risks in the Data Age, but so much more opportunity.

- For all the challenges, many also believe an opportunity exists, and 63% report that their organization knows how to capitalize on that opportunity, and three in five believe they have the right leadership, technology and personnel to do so.
- Across the five sectors surveyed, IT and business managers in four are most likely to believe that theirs is among the two best-positioned to benefit from the wave of data generated by, and generating, the Data Age, suggesting that they recognize the unique opportunities the Data Age presents for their sector and are confident they can seize those opportunities.

Even if dark data does not get proportionally worse, rising data volume may lead to more dark data



The Data Age

Digital transformation is accelerating. Emerging technologies — led in large part by the six technologies examined closely in our study — are maturing, services are going online faster than ever before, and in recent months, the COVID-19 pandemic suddenly forced a substantial share of the world's workforce to shift to remote work. All these societal changes, combined with two decades of digital transformation and the promise of transformational emerging technologies, are culminating in the Data Age — and organizations aren't ready.

This lack of preparation is meaningful. Legacy businesses that struggled to adapt to digitization were quickly overtaken and forced into irrelevance by digital-first startups. Perhaps the most memorable example of this is Netflix's meteoric rise in the American household, entirely replacing Blockbuster as the American go-to for in-home video rental, and now displacing cable and satellite television and challenging Hollywood as a content creator.

Going even further back, the Industrial Revolution evolved in much a similar way.

Over the course of 50 years, basic technologies, processes and lifestyles were transforming before the new era fully blossomed. Similarly, the evolution of computing from its mainframe days, and the internet from its earliest pre-commercial application, led to an era of transformation that set the stage for the true Data Age revolution, built on deep interconnectedness and the centrality of data.

That's where we are now, in a shift from the 1990s' legacy methods to modern digital enterprises empowered by technologies with the promise to entirely uproot the way businesses operate, all coming to a boiling point as we fully enter the age of digital data.

The Volume and Value of Data Are Growing Together

Data is expanding: The amount of information in the world grows daily, from every scientific breakthrough and every email. Yet just two-thirds of the IT and business managers we surveyed expect their organization's data volume — the amount of data organizations generate and receive — to increase between now and 2025. The degree of growth predicted by those two-thirds is significant; IT and business managers estimate, on average, that by 2025 their organizations will have 4.8 times the amount of data they currently generate and receive. Public sector employees expect lower growth (3.5x), while those in financial services foresee higher growth (5.7x). There is even more variability by country. Our two APAC countries, China and Japan, expect data to grow by factors less than four, while the Dutch expect roughly twice that, predicting a growth factor of 7.1x. Even the lower range, in such a short span of time, represents data growth that is nothing less than explosive.

“There’s going to be an explosion of new data, for sure. ... We’re adding more and more devices. We’re getting even faster mobile internet. And currently, the capabilities that we have in terms of handling it are just not sufficient.”

— **CTO and Managing Director,**
German financial services sector

The Data Age

Across the globe, but especially in China and Japan, data is widely recognized as valuable, and likely to expand in volume.

	Total	United States	United Kingdom	France	Netherlands	Germany	China	Japan	Australia
Percentage who expect data will grow over the next five years	67%	62%	62%	67%	60%	64%	89%	75%	60%
Expected growth factor	4.8x	5.2x	4.8x	4.1x	7.1x	4.5x	3.9x	3.1x	5.9x

Virtually no one doubts the value of data to their organization's overall success and operations, and 67% expect that value to grow over the next 10 years. These figures leave the picture of data value unchanged from 2019 (See [The State of Dark Data](#) report, April 2019), when IT and business managers described the value of data to every aspect of their organization, from its efficiency to its profitability. Against the backdrop of rapid data growth, the increasing value of data means more value for organizations to capture or leave behind, with consequences either way.

This explosion of data volume in these early days of the Data Age will challenge organizations, as many are struggling with the data they already have. Only 51% report that their organization is "very good" at managing its data, and only 47% report the same for their organization's skill in leveraging its data. These represent significant room for improvement. As we observed in the 2019 report, the challenges confronting organizations in managing and leveraging data are diverse and include:

- Integrating data from multiple sources (cited by 83% of respondents)
- Lack of resources (78%)
- Lack of necessary skills in the organization (78%)
- Difficulty recognizing which data is important (77%)
- Difficulty recognizing which data the organization has access to (75%)
- Too much emphasis on data analysis and not enough on collection and management (73%)

Two challenges are of particular interest on the cusp of this new age of data — the sheer volume of data and the introduction of new technology (each cited by 82% of respondents). Both challenges are likely to become more pronounced as data volume grows, and new data-rich technologies arrive, over the next five years.

Emerging Technologies and the Data Age

The Data Age itself is driven by the emergence, adoption and maturation of technologies that change the way organizations operate and how they interact with their customers, their clients and their data. Chief among those technologies are: 5G, the Internet of Things (IoT), artificial intelligence/machine learning (AI/ML), augmented and virtual reality (AR/VR), blockchain, and edge computing. Each of these technologies has its own relationship with data. Some of these technologies — IoT, AR/VR, blockchain — directly create data, and the others — 5G, edge computing, AI/ML — create the conditions that breed data. Whether the technology creates data directly or not, each will have a significant impact on data volume and the Data Age, allowing it to be put to work in ever more productive ways.

Organizations do not have to create or even consume these technologies to be swept up in the Data Age. It is simply easier to consume data today, thanks to faster and better data transfer and processing, lower latency times, and the collection of data that before had simply disappeared. In this sense, there is a data ecosystem in which all organizations will

experience the challenges and opportunities of the Data Age. Take as example video streaming services, which don't build 5G networks but whose product is enabled by it, and which are likely to see rising data volume as their customers increase streaming via those networks.

Currently, the IT and business managers we surveyed display an optimistic confidence about the adoption of the technologies driving the next data wave, and our data points to rapid adoption and rollout within a relatively short span of time. What we're not seeing, however, is an appreciation for the challenges these technologies, and their contributions to increased data, will bring to all organizations.

The pieces of the puzzle are plainly there: IT and business managers tell us dark data is driven by data volume, and most expect these new technologies to create even more data. Yet too few appreciate what this means for dark data, namely that if organizations do not prepare well, the adoption of new technologies will worsen their dark data challenges and make it more difficult for them to capture the value and opportunity the Data Age offers.

“It’s a race. It’s all about who figures it out first ... If they can figure it out faster than other players in their field, they do get a competitive advantage.”

— CTO and Managing Director,
German financial services sector

5G: Data at Warp Speed

Chief among the technologies driving the Data Age is 5G connectivity, which will bring faster and lower-latency data transfer to more people in more places. The net effect will be to create new data generators and consumers and to enable existing generators and consumers to create and consume ever more data.

Many IT and business managers don't have a strong grasp of 5G technology, with just 44% saying they understand the technology well or at an expert level. As we see for other technologies, our survey respondents have a general tendency to rate their

own understanding of a technology as superior to that of their colleagues, organization and industry.

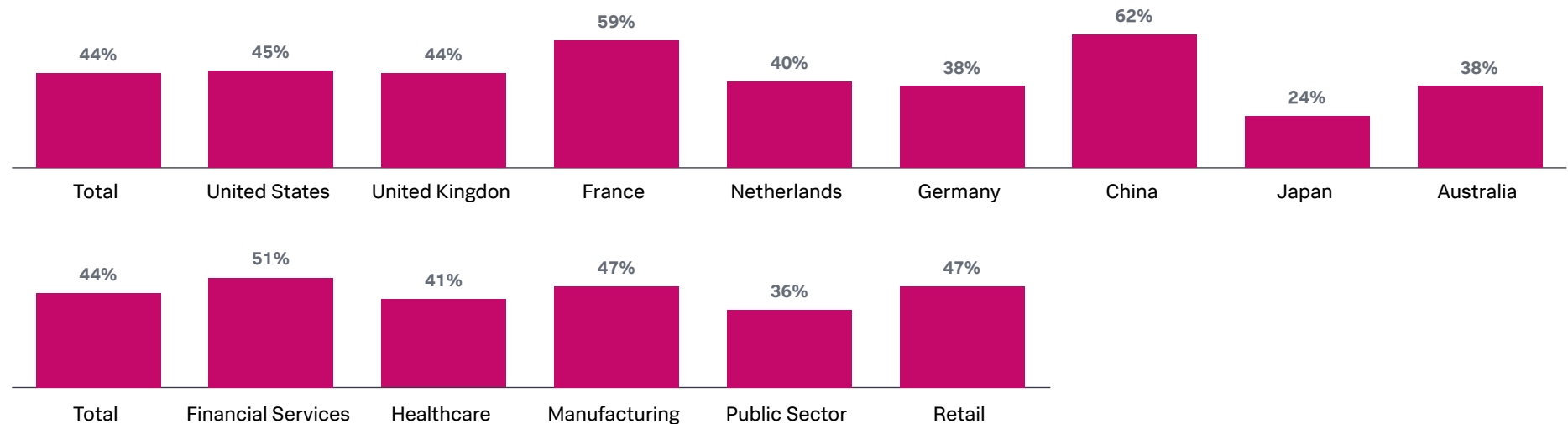
As we observed throughout this survey, there is a divide across sectors, with those in the private sphere saying they're more current than public sector organizations. Here, just 36% of IT and business managers in the public sector say they understand 5G well or have an expert understanding, whereas 51% report the same level of understanding in the financial services sector. Similar disparities play out across countries, with 59% in France and 62% in China saying they're confident in their understanding of 5G, while only 24% in Japan feel the same way.

“5G will completely change user experience because of the high-speed connectivity, low latency, multiple connections.”

— EVP, CIO & CISO, Japanese retail sector

Across countries and sectors, understanding of 5G technology is highly variable.

Those who rate their own understanding of 5G as “expert” or “high”



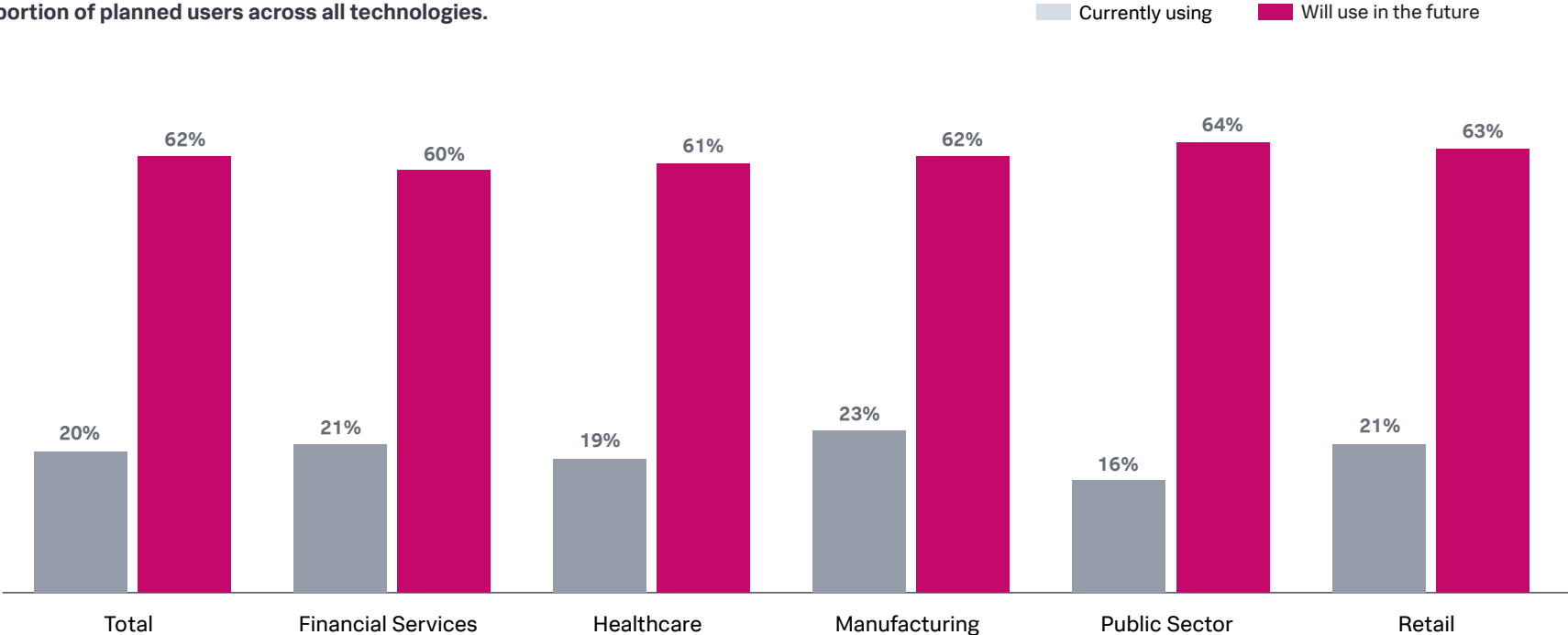
Emerging Technologies and the Data Age

This lack of understanding among so large a proportion of IT and business managers may be why just 59% foresee 5G increasing their organization’s data volume and why, despite four in five respondents citing data volume as the primary challenge in discovering and accessing their organization’s dark data, nearly three times as many believe 5G will solve their dark data challenges as exacerbate them (31% vs. 11%).

5G stands out among these six technologies for having the fewest current users but most future users. Twenty percent of IT and business managers report that their organization is currently using 5G, and 62% report that they will use it in the future. Among these future users, 5G has the shortest implementation timeline of these six technologies, with respondents estimating that their organization will actively use 5G in 2.6 years, on average — the most aggressive adoption prediction for any of the six technologies.

These are promising signals for 5G. Twenty-four percent of current and future 5G users have use cases for 5G currently in place, and 41% have use cases in development. Among our verticals, financial services and retail are furthest along in implementation, while across markets, China, Germany and the United States are leaders.

5G has the lowest proportion of current users, but highest proportion of planned users across all technologies.



Edge Computing: The Hidden Infrastructure Powering Innovation

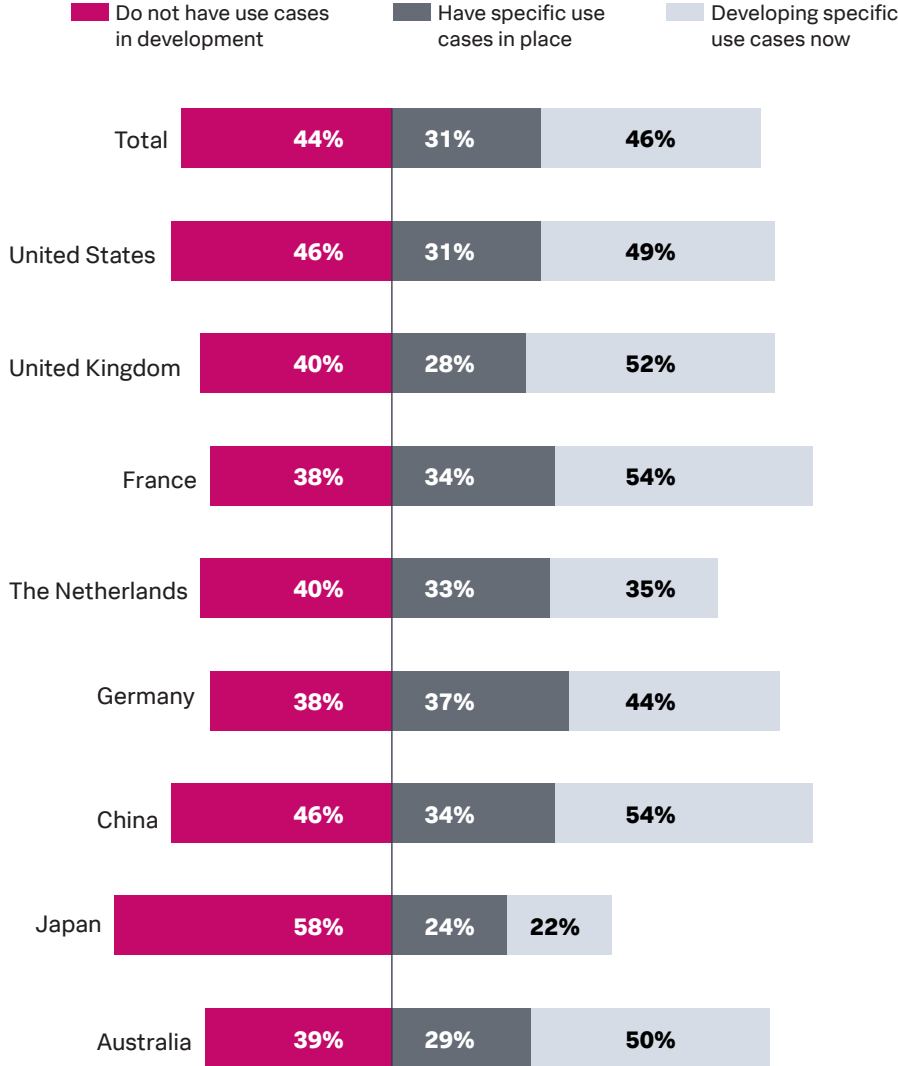
Edge computing will play a similar role in enabling faster data transfer by reducing latency times and increasing storage capacity. It is a key infrastructure innovation that will make possible other emerging technologies that rely on near-instantaneous data transfer, such as autonomous vehicles.

Edge computing is among the technologies least understood by our respondents, with just 39% understanding it well or at an expert level. A behind-the-scenes tool even within the often-overlooked arena of data storage infrastructure, fully 25% of IT and business managers don't know their organization's intentions for edge computing, while 24% report that their organization has already adopted it. A further 44% report that their company will adopt it in the future, within an average expected time of 3.1 years before it is online.

Among current and future users, 46% have an edge computing use case in development. As with 5G, many respondents report intentions even as actual use cases have yet to develop. This trend is especially notable in Japan, where 49% report that their organization will use edge computing in the future, but 58% do not yet have a use case in development.

Fewer than half — 48% — of IT and business managers expect edge computing to increase the amount of data their organization works with, while 27% expect it to neither increase nor decrease their organization's data volume, and 18% are unsure of the impact. Yet despite a near-majority believing edge computing will increase data volume, only 12% believe edge computing will worsen their dark data problems.

Despite optimism about the use of edge computing, more organizations are not even developing use cases than have specific use cases in place today.



Blockchain: Democratized Data Security and Transparency

Blockchain is used to protect against cyberthreats by democratizing ownership of data so that no single bad actor can commit fraud or steal information. It represents a leap forward in security and transparency and is expected to be especially relevant in sectors in which the integrity of records and data is crucial, such as finance and healthcare.

Twenty-four percent of IT and business managers report that their organizations are using blockchain. An additional 45% report that they will use blockchain, with an average adoption timeline of 3.1 years. Retail, finance and manufacturing appear to be furthest along in adoption. Thirty-one percent have specific blockchain use cases in place, while 44% have them in development.

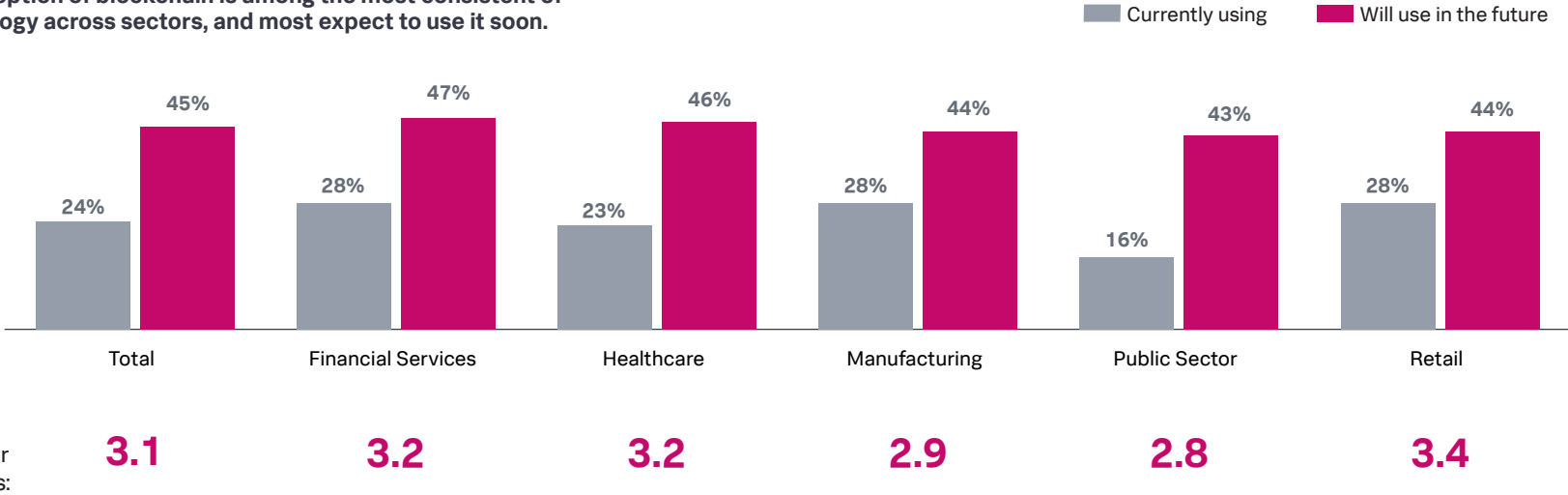
Forty-eight percent expect blockchain to increase their organization’s data volume, and just 10% expect it to worsen their organization’s dark data challenges, suggesting that respondents may recognize blockchain’s inherent ability to improve data visibility and transparency.

Nearly a quarter (22%) of respondents don’t know their organization’s intent around blockchain, and this isn’t surprising. It’s one of the more complicated Data Age technologies, reflected in just 38% of IT and business managers reporting they understand it well or have an expert understanding. Just over a third (35%) report a similar level of understanding for their organization as a whole.

“The technology is mature and its implementation may be relatively quick, so organizations setting up blockchain within three years are being completely realistic.”

— **Technology Director,**
French healthcare sector

Planned adoption of blockchain is among the most consistent of any technology across sectors, and most expect to use it soon.



Augmented Reality and Virtual Reality: Revolutionizing How Surgeons and High-Tech Manufacturers Do Their Jobs

To the average consumer, augmented and virtual reality have long been on the horizon but never quite within reach. Behind the scenes, however, they have become core tools in fields like manufacturing, where these are being used to make work safer and more efficient, and healthcare, where doctors use the technologies to visualize anatomy during procedures.

Of the technologies driving the Data Age, augmented and virtual reality are perhaps most familiar to consumers from their entertainment applications. Virtual reality has been available to consumers in

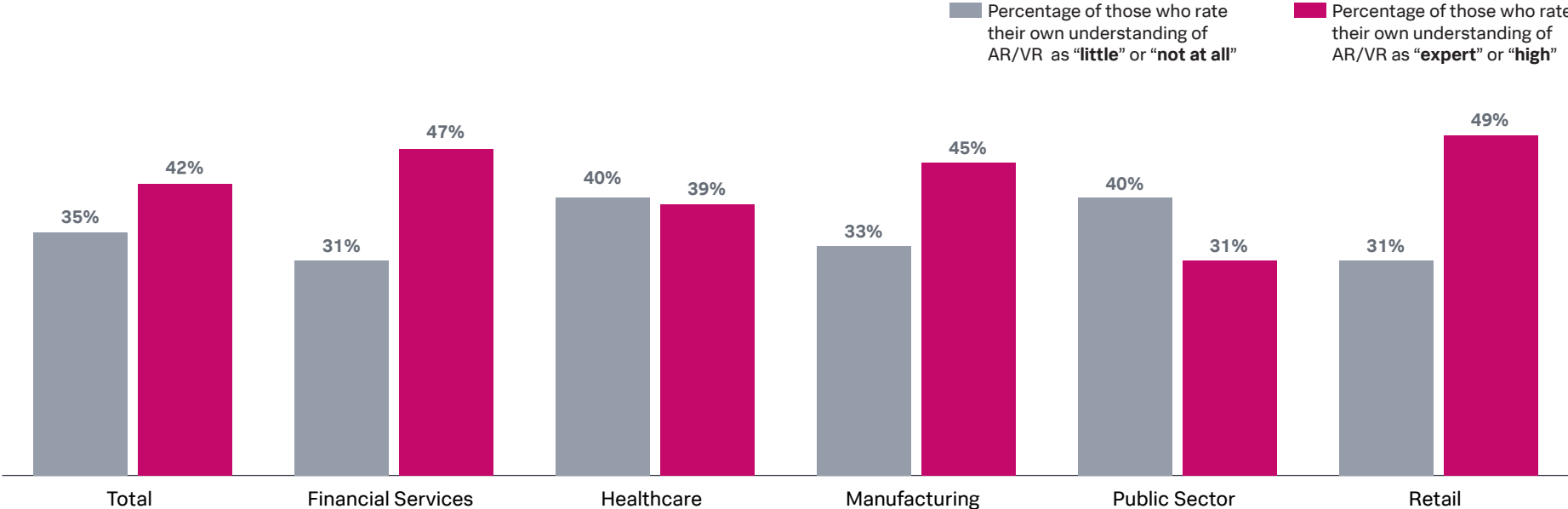
the form of games since the 1980s, augmented reality enjoyed a consumer golden age with games like Pokémon Go, and AR and VR apps and devices have seen renewed interest in the past several years. Despite this, AR/VR is the least understood of these technologies. While 42% of IT and business managers say they understand these well or have an expert understanding, 35% admit to understanding it only a little or not at all, a higher proportion even than famously unfathomable blockchain.

Twenty-two percent of respondents report that their organizations are currently using AR or VR technology, with an additional 47% planning to use it in the future. In manufacturing, 27% report that their organization is a current user (22% in healthcare),

and 46% are future users (50% in healthcare). Those who will be using AR/VR in the future expect it to be in place in 3.2 years, on average.

Among current and future users, 30% report that their organization has a use case in place, and 46% have use cases in active development. A surprisingly low 49% expect AR/VR, a data-intense technology, to increase their organization's data volume, and only 12% expect it to worsen their dark data challenges, while 23% believe it will solve them (29% say it will solve some, worsen others). This disconnect reinforces that many IT and business managers are not foreseeing the challenges that come with the technology and growing data volume.

Retailers, manufacturers and financial services leaders understand AR/VR best, while healthcare and the public sector lag.



Artificial Intelligence and Machine Learning: Efficiency and Discovery Powered by Data

Artificial intelligence and machine learning (AI/ML) are arguably the most important innovations of the Data Age unfolding today. Certainly, they have attracted substantial attention, not surprising given their breakthrough potential in easy-to-grasp applications like autonomous driving and healthcare diagnostics. The IT and business managers we surveyed confirmed the central place data has in AI, and the role AI has in data. This symbiotic relationship begins with the simple fact that data is an essential ingredient of artificial intelligence, the material from which machines learn. At the same time, respondents expect AI to solve some of the central challenges facing data professionals by analyzing quantities of data too vast to be analyzed by humans. For all this attention, the percentage of IT and business managers who understand AI/ML well or have an expert understanding — 42% — indicates a

significant knowledge gap for so crucial a component of the Data Age.

However, 25% report that their organizations have adopted AI/ML in some form, and 51% report that their organization will be using AI/ML in the future, with an average time-to-use of 3.3 years. Across sectors, 30% of these current and future users report having specific use cases in place, and 44% are developing use cases now.

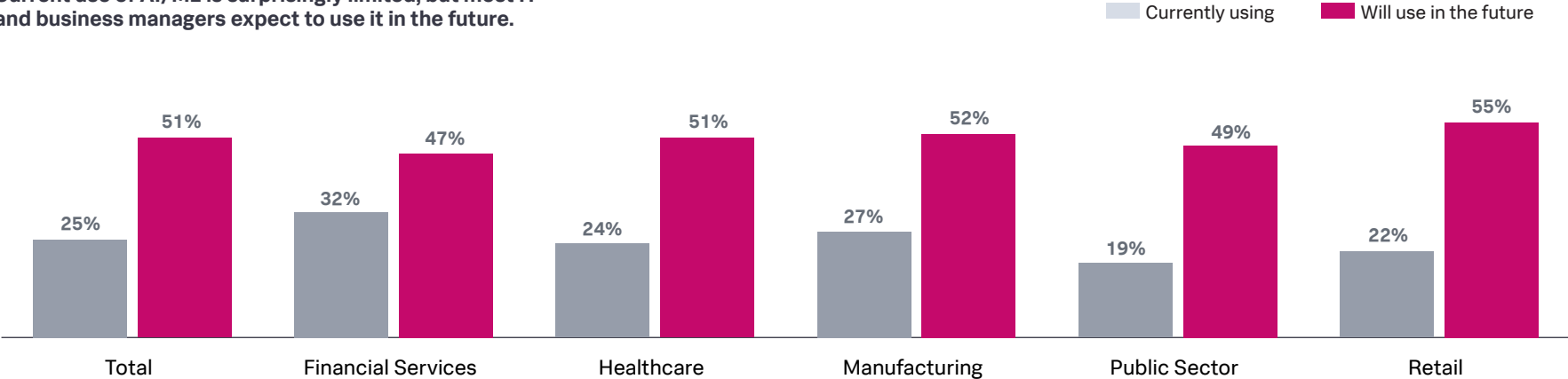
Financial services is furthest along, but only 32% are currently using AI/ML in some way (47% future users), and 35% of current and future users have use cases in place. Future users in finance are predicting that they will be able to implement AI/ML in less than three years.

Fifty-four percent expect AI/ML to increase their organization's data volume, perhaps by enabling organizations to put to work data they have previously been unable to utilize or to bring in more data they've avoided for want of analytics resources.

“Most companies who don’t use AI in some way, I would think of them as disadvantaged. ... Competitors are just going to eat you up.”

— CTO and Managing Director, German financial services sector

Current use of AI/ML is surprisingly limited; but most IT and business managers expect to use it in the future.



Internet of Things (IoT): Capturing Data That Didn't Exist Before

The Internet of Things has had a tremendous few years, reaching further into consumer technology and finding crossover with other emerging technologies such as AI/ML. To consumers, IoT technology means devices such as wearables, smart thermostats and appliances, and connected devices from doorbells to garage door openers. To business, IoT means these things and more, perhaps most visibly the sensors now integral to heavy equipment, assembly lines, utilities and other industrial tools and applications. IoT devices in these settings are collecting machine data, the world's most ubiquitous and too often untapped form of data.

Forty-five percent of IT and business managers profess to understand IoT well or to have an expert understanding, higher than the other technologies driving the wave (though by just one percentage point compared to 5G). Fifty percent of IT and business managers in manufacturing, 51% in financial services, and 51% in retail claim this superior understanding.

IoT enjoys the highest current usage rate among the IT and business managers we surveyed, with 28%

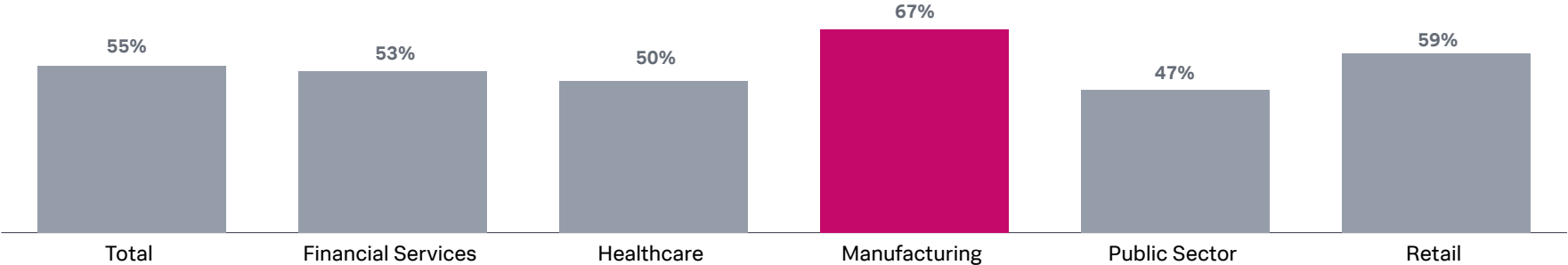
currently using IoT technology and an additional 48% reporting their organization will be using it in the future. These future users expect to be using IoT devices in three years, on average. Thirty-three percent of the current and future users have use cases in place, and 45% are developing specific use cases now. Manufacturing, not surprisingly, enjoys the highest current use rate across the surveyed sectors (35%), and 45% of current and future users in the sector have use cases in development.

The Internet of Things, by its very nature, is a data generator. Often, it is collecting data that before would never have been captured. Yet only 55% of respondents report that IoT will increase their organization's data volume, and still more puzzling, just 12% believe IoT will worsen their dark data challenges, while an additional 28% believe it will solve some challenges while worsening others. The sectors benefiting most from IoT, however, have a somewhat better grasp of the data volume challenges of IoT, with 67% in manufacturing and 59% in retail knowing it will increase their data volume, and these sectors tend to see IoT as more likely to solve than worsen dark data challenges.

“The Internet of Things makes for a lean and efficiently run operation. This has enabled us to save payroll and have a more streamlined business.”

— Director, British retail sector

Fully two-thirds of manufacturers expect IoT to increase data volume, compared to just over half all sectors



Successful Technology Adoption and Implementation Require Planning

It's clear in our research, and in the technology industry more broadly, that 5G, edge computing, blockchain, AR/VR, AI/ML and IoT all have the potential to transform the way businesses operate, at a scale and pace rarely seen. Yet we're only just beginning to conceptualize the extent of that transformative potential as these technologies mature and adoption increases, and of course, implementation of these powerful technologies is not without its own set of challenges.

Across the six technologies we studied, respondents told us that they face an array of challenges in adoption and implementation. Asked about nine

potential challenges they might face in the process of implementing these technologies, respondents identified all as challenges that they anticipate for their organizations: a lack of proper personnel, lack of understanding of the technology, lack of funding, lack of clear use cases, lack of support from senior leaders, difficulty leveraging data, difficulty managing data, difficulty identifying useful data, and difficulty discovering and accessing dark data. Because challenges are so widespread and systematic, the solutions must be holistic.

The executives we interviewed emphasized that organizations must be purposeful in pursuing these solutions and, critically, in evaluating technologies to realize their full potential.

“I think it’s incumbent upon leaders and organizations to really provide that focus ... We could be a mile wide and an inch deep and not accomplish a lot, or we could go deep in these areas that we think are going to deliver the most value and do those completely. I think that latter approach is what most organizations struggle to find, the focus to deliver that depth.”

— CDO, Australian healthcare sector

Despite Unprecedented Challenges, It's Not Too Late to Seize Opportunity

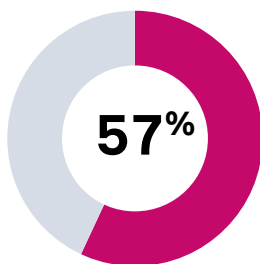
We are in the midst of a revolution. Revolutions are inherently disruptive, and the Data Age brings organizations both challenges and opportunities. In the next few years, six emerging technologies will present unprecedented transformative potential and will contribute significantly to exponential growth of data volume. These and other digital technologies will produce massive shifts in the way we live and work. After witnessing the levels of disruption and transformation wrought by the Internet, email, WiFi, smart phones and 4G connectivity, cloud computing and big data analytics, it is surprising that more organizations aren't attempting to get the jump on such data-driving, and data-driven, technologies as AI, 5G and the rest.

Many of the organizations we surveyed suffer a lack of awareness and urgency, a failure to appreciate what the Data Age means. There's also a technological lack of readiness. Most organizations are not prepared for an influx of data on this scale. As noted, 53% of respondents say their organizations are not preparing for these new technologies and the steady, or perhaps sudden, increase in data. And of the 86% whose organizations are not already prepared (the 53% who aren't yet trying, and the 33% who say the work is in progress), only 8% are very confident their organization will be prepared in time. Sixteen percent say they know that their organization will not be prepared in time.

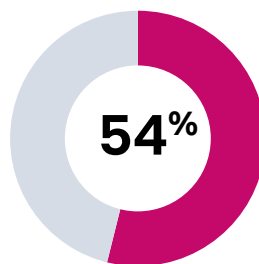
“I think the anxiety may come from the people who see the wave coming, and they don't have a model for how to deal with it.”

— CIO, U.S. public sector

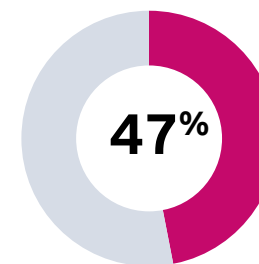
Organizations are already stretched to their potential, and rapid data growth could push some over the edge.



The volume of data is already growing faster than my organization's ability to keep up with it



I'm concerned my organization is not up to the challenges posed by this coming data wave



My organization will fall behind on this coming data wave

Despite Unprecedented Challenges, It's Not Too Late to Seize Opportunity

Across all five industry sectors we surveyed, managing data volume is the most anticipated challenge of the next wave of data (cited by 46% of respondents). Fifty-seven percent say that data volume is already growing faster than their organization's ability to keep up with it. Further, 53% say that no one in their organization is having conversations about the impact of rapid data growth. Not surprisingly, then, 54% are concerned that their organization is not up to the challenge posed by this next wave of data.

The opportunity is twofold. First, it's a chance to proactively address dark data challenges, capturing value now and in the future. Second, it's an opportunity to get ahead of the competition, even as already competitive markets grow more competitive still. Our respondents are optimistic: Despite revealing a lack of preparedness, majorities of respondents are confident that their organization understands how to capitalize on the opportunities presented by the wave of data this revolution is creating (63% agree) and that their organization's leadership is prepared to do so as well (62%).

Indeed, the senior executives we interviewed are energized by these opportunities specifically because they know that in the Data Age, data is how they differentiate their organizations and win. And when asked which of these five sectors is best positioned to benefit from the data wave, most of our survey respondents picked their own industry. We think they're all correct.

“The consequence of not being prepared for data growth is that if someone else harnesses it and differentiates themselves competitively in the market, they can put you out of business. ... Isn't that the consequence always in business?”

— CDO, Australian healthcare sector

Key Recommendations

Few sectors have not been touched by digital disruption in the past quarter-century, and the impact of new technologies will only increase. Now is the time to prepare. Though data volume steadily increases, the technologies driving the next wave of data still lack maturity and widespread adoption. That offers a narrow window for organizations to grapple with these challenges and plan for success.

In this new environment of accelerated transformation, there may be a very high penalty for burying one's head in the sand, and tremendous rewards for those organizations that meet the Data Age head-on. Here are some first steps for doing just that.

1 Put all your data to work. Few organizations can say that their data is optimally organized, managed and leveraged. As this research shows, few organizations can even say where half of their data is. Inventory the data you hold, the sources of that data, and the processes by which it is ingested, managed and analyzed. For your data assets, there is no better tomorrow until you start engineering a better today.

2 Build a data strategy from your business strategy. Your organization's ongoing digital transformation, its arrival in the Data Age, will be driven by business need. What data will drive (or derive from) your business growth? How will improvements to your products or services incorporate new data and new technologies? Recognizing the changes that will result from your IT roadmap and your five-year business plan, incorporate a strategy for how you will be prepared to manage all that data, and leverage it appropriately across your entire organization. Consumers are increasingly driven by digital experience and brand loyalty, and that affects B2B, higher education and the public sector, as well.

3 Make security a foundational principle. It's inseparable from your data strategy, but vital enough to call out separately, because your approach to security today will fail you tomorrow. Your organization itself is changing (how much more work from home are you seeing, versus 2019?), which means new attack surfaces and vectors. You'll be incorporating new technology, using data in new ways, which will increase the risk of breach, loss or compliance failures. In step with improving how you leverage data, plan for how you'll secure vastly greater volumes and varieties of data — in the very near future. A business that is not trusted with its customers' data doesn't have much of a future.

4 Outgrow the piecemeal approach. Recognize that data must be managed holistically. Your CFO doesn't oversee *some* of your spending, and similarly, management of your data assets should span your entire organization. Standardize tools, processes and skill sets so that every person in your organization has the right access to the right data, and the ability to turn it into mission-driving action.

5 Promote everyone to data scientist. Okay, not literally. But understand that every role in your organization is, or soon will be, driven by data. Every decision, from the design of a new product down to where to put the "click here" button on your sales emails, should be determined through data analysis. The micro-decisions that are made by front-line staff every day end up having a macro impact on the organization's transformation. Do your engineers, graphic designers, marketers, sales leads, etc. have access to the data they need, the tools to analyze it, and the skills to do so? Begin standardizing tools, training employees, and hiring talent with skills you've never sought before.

Appendix: Industry Highlights

Retail

Retailers are very close to the overall average across industries when it comes to data value and their expectations for data in the future. Just over two-thirds (69%) of retail respondents expect the volume and the value of data to increase over the next five years. In fact, retailers expect data to grow by the second-largest factor of any industry, believing that data will balloon by a factor of 5.1x between now and 2025.

Despite a stronger-than-average recognition that data carries significant value for organizational success, nearly three-quarters (72%) of retail organizations report that half or more of their data is dark, up from 61% in 2019. This ties back to retailers' struggles with data volume. Retailers, tied with healthcare, are the most likely to say that the volume of data is already growing faster than their organization's ability to keep up.

Retailers are at the forefront of adopting use cases for Data Age technologies. Across the six emerging technologies we asked about, retailers are among the top two industries, with use cases in place for five of them. Surprisingly, though, the retail industry is the second lowest in adoption of AI/ML, only slightly ahead of the public sector.

More so than average, retailers say that this next wave of data presents an opportunity to proactively address dark data challenges, and 70% agree that their organization is making an effort to discover and access dark data to get ahead of the next wave of data. Given that retailers are on the leading edge of technology adoption, and such a strong majority recognize the opportunity the Data Age presents, the retail industry may be preparing more deliberately than other sectors.



“Right now, many companies, including ourselves, are struggling with coming up with the right to use cases of 5G ... but if we add the data-centric approach to 5G, also using a machine learning and deep learning technology, something amazing can happen.”

— EVP, CIO & CISO, Japanese retail sector

Healthcare

In healthcare, fewer managers than in any other vertical expect the volume of data to increase, though that proportion is still a majority (61%). Healthcare organizations also rate themselves the second lowest in their skill at managing and leveraging data, a consistent finding when considering the profundity of dark data in healthcare organizations. Sixty-two percent of healthcare organizations say that half or more of their data is dark. More than 80% say that data is valuable to their organization's overall success and operations, suggesting that healthcare managers recognize that untapped data is untapped value.

Unlike retailers, healthcare organizations are closer to average in their expectations for adopting emerging technologies. Fewer healthcare managers than average expect that emerging technologies will lead to increases in data volume. It's possible that the healthcare sector is missing the connection between the rapidly growing data volume that Data Age technologies will create and the organizational consequences.

Our respondents rate healthcare as the industry second most likely to benefit from the Data Age, but healthcare leaders must recognize the implications that exploding data volume will carry to capitalize on the opportunity as much as possible.



“In healthcare, when we’re looking at a patient and a patient record, we’re looking at a small fraction of the data that exists around that patient ... Data is the main thing that I think will transform healthcare in the future.”

— CDO, Australian healthcare sector

Financial Services

More than other verticals, financial services managers value data as an enabler of cybersecurity (84% rate this as extremely or very valuable), suggesting that the sector recognizes and prioritizes the sensitive customer data it possesses. Financial services professionals also expect the volume of data will grow more than any other industry — by a factor of 5.7x. This sector clearly recognizes that data volume and data value will grow in tandem.

From an emerging technologies perspective, financial services managers are among the most confident in their own understanding of the technologies, especially when it comes to AI/ML, where 52% say they have an expert or high understanding, compared to 42% across all industries. To an even greater extent than the retail industry, financial services is at the forefront of developing use cases for emerging technologies. For five of the six techs, financial services is the top vertical in terms of current development of use cases.

These conditions suggest the financial services industry is approaching the Data Age from the greatest position of strength among all five verticals. Financial services was identified by 58% of respondents as one of the two industries among those surveyed as best-positioned to benefit from the explosion of data the Data Age will create, with healthcare a distant second (36%).



“I definitely think coming waves of data are a huge opportunity to create a competitive advantage.”

— **CTO and Managing Director**, German financial services sector

Manufacturing

Seventy-eight percent of manufacturers expect data volumes to increase over the next five years, more than any other industry. The extent to which manufacturers expect data volume to balloon, however, is only slightly above average at an expected growth factor of 5x. In addition to strong majorities expecting the volume of data to increase, more than three in four (76%) expect the value of data will increase over time. Even more than financial services, the manufacturing industry recognizes the relationship between growing data volume and value at the outset of the Data Age.

Manufacturers more than any other industry expect emerging technologies will increase data volume — nearly two-thirds expect 5G and IoT will increase data volume for organizations. Manufacturers recognize that these transformative techs are the driving factor behind the Data Age.

While the manufacturing industry may be connecting the dots between data volume, value, technologies and the culmination of these forces creating the Data Age, the sector is less prepared than the financial services sector for these large-scale changes. Half of manufacturing organizations are either prepared or preparing for rapid data growth, compared to 56% of financial services organizations.



“Ensure that you discuss accelerated data growth at every meeting. Keep it on your agendas. Ensure that you have people and processes in place to advance your data preparation.”

— **Director**, UK manufacturing sector

Public Sector

Most public sector managers expect data volume to increase over the next five years, but they estimate that the magnitude will be much smaller than respondents in other verticals. The public sector's expectation for data growth is a factor of 3.5x, compared to an expected growth factor of nearly 5x across all industries. While 60% of public sector respondents expect that the value of data will grow in the near future, they are facing significant challenges in putting data to work, including integrating data from multiple sources, managing the volume of data and overcoming a lack of resources.

Given the uphill battle the public sector faces in putting its existing data to work, it's not surprising that the sector is also behind the curve in understanding and adopting all six emerging technologies. For five of the six emerging technologies we asked about, fewer than 20% of public sector organizations are using the technology. The public sector also expects the longest timeline for adoption for all six emerging technologies, suggesting that the competitive pressure felt by other verticals may be a factor accelerating investment and adoption of emerging technologies.

The public sector's present-day struggles with data volume and its pessimistic outlook on emerging technologies do not position the sector well at the outset of the Data Age. Only 23% of public sector respondents are aware of the magnitude that data volume will expand, and 89% are not yet prepared for rapid data growth. To prepare itself for the Data Age, the public sector must begin with a systematic assessment of its data and technology infrastructure as it stands today. Only after addressing the immediate problems, and implementing systems that allow prepare for the influx of data volume, will the sector be ready to capitalize on the opportunities the Data Age offers.



“Dark data is a constant issue, or more commonly it’s data some parts of the organization know about but others do not.”

— **Asst. Director**, Australian public sector

Appendix:

Market Highlights

Australia: Australian respondents expect that data will grow by the second largest factor across the eight markets — a factor of 5.9x. Organizations in Australia may struggle to capitalize on the value associated with the data growth they expect, as **83% say the introduction of new technologies is a primary challenge** to managing and leveraging data.

China: Respondents from China recognize the value of data more than any other market, and 90% expect its value will grow over the next decade. Additionally, the Chinese market is by far the most optimistic about the impact of emerging technologies but are aware of the relationship between emerging technologies and data growth — they expect technology to increase data volume more than any other market. The recognition of that relationship is evident in China's advanced preparation for data volume growth — **83% of Chinese organizations are currently prepared or preparing for rapid data growth**, compared to just 47% across all regions.

France: Rapidly rising data volumes may pose a threat to French organizations, where respondents are among the least confident in their ability to manage data. Today's data management challenges could prove problematic for French businesses, as **59% say that no one in their organization is having conversations about the impact of the next wave of data**.

Germany: German respondents are the least optimistic about the growing value of data. Just **58% of German IT and business managers expect data to become more valuable over the next decade**, compared with 67% across regions. Across all six technologies, fewer German respondents than average believe the technologies will lead to increased data volume, suggesting German businesses may not understand how emerging technologies are driving the Data Age.

Japan: In stark contrast to China, Japan is much slower when it comes to adopting emerging technologies. Japanese respondents expect the longest timeline to implementation for all six emerging technologies. Japanese organizations are also slower in terms of staying up to date in new developments in data. **Two-thirds (67%) say their organization is struggling to stay up to date**, compared to the global average of 58%.

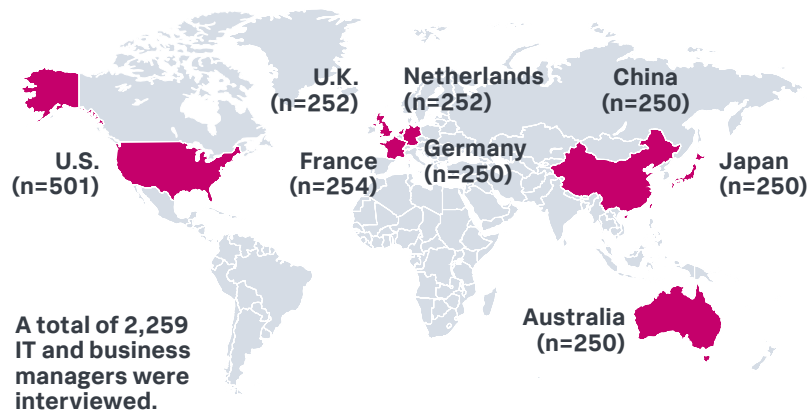
Netherlands: Dutch managers expect data volume to increase by more than 7x, significantly higher than the global average of 4.8x. Still, **45% are surprised by the magnitude of the data growth the Data Age presents**. Like their German counterparts, Dutch respondents may be missing the connection between emerging technologies and data growth, as fewer respondents from the Netherlands than the global average expect emerging technologies to grow data volume.

United Kingdom: UK managers report relatively low current usage of emerging technologies but are optimistic about plans to use them in the future. For example, just **19% of UK respondents say they are currently using AI/ML technologies, but 58% say they will use them in the future**.

United States: Americans clearly recognize the value of data, as **84% say data is extremely or very valuable to their organization's overall success**. U.S. IT and business managers are slightly less likely than average to say that data will grow in volume over the next five years (62% compared to 67% across regions). Despite this below-average expectation for data growth, Americans are the second most confident in their ability to prepare for rapid data growth, with 59% indicating they are at least somewhat confident.

Survey Methodology

This report is based on a survey conducted in eight countries by TRUE Global Intelligence, the in-house research practice of FleishmanHillard, and sponsored and directed by Splunk. The respondents are global business and IT executives and managers engaged with how their organizations collect, manage and use data. Evenly split between IT and business roles, the respondents were 23% C-suite/owners and senior leadership (VP/SVP), 26% director-level, and 51% managers. The survey was conducted in two rounds of interviewing in October 2019 and January 2020 in the following markets, in local languages:



Respondents were presented with the following definitions when taking the survey:

- Data: Information that can be captured, quantified and analyzed.
- Dark data: Data an organization either possesses but does not know it possesses, or data an organization knows it possesses but has not successfully leveraged
- Using a technology: Producing the technology (developing original solutions using this technology); consuming the technology (using products driven by this technology); or leveraging the technology (creating organizational or product strategies that take advantage of the new technology without your organization's direct production or consumption of it)¹

Additionally, five, one-hour in-depth interviews were conducted in early March 2020 with senior technology leaders from the U.S., Australia, Japan and Germany. Four of these interviewees are C-suite technology executives, while the fifth has served as a principal R&D engineer in high-tech manufacturing.

¹Technology "use" and "adoption" have been used synonymously throughout this report.

Audience Profile

All respondents	% of total
Employed full time	94%
Financial services	17%
Healthcare (private or public)	19%
Retail	18%
Manufacturing	22%
Public sector	25%
C-suite/President/Owner	14%
SVP/VP/Managing Director	9%
Director/Senior Manager	26%
Manager	51%
Fewer than 100 employees	20%
100 to 499	28%
500 to 999	19%
1,000 or more	33%

IT manager respondents	% of total
Regularly involved in/has oversight of:	
IT operations	70%
Cybersecurity	55%
Business analytics	46%
Data science/Data analytics	49%
Internet of Things/IoT	50%

Business manager respondents	% of total
I use data to solve problems and/or inform business decisions	75%
I work closely with our data teams to solve problems and/or inform business decisions	43%



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This ESG Research Insight Paper was commissioned by Splunk, Inc.

20-13977-Splunk-Data Age Report-EB-121