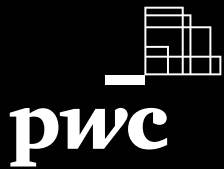


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In the age
of data,
why are
there so
few Chief
Data Officers?





PwC

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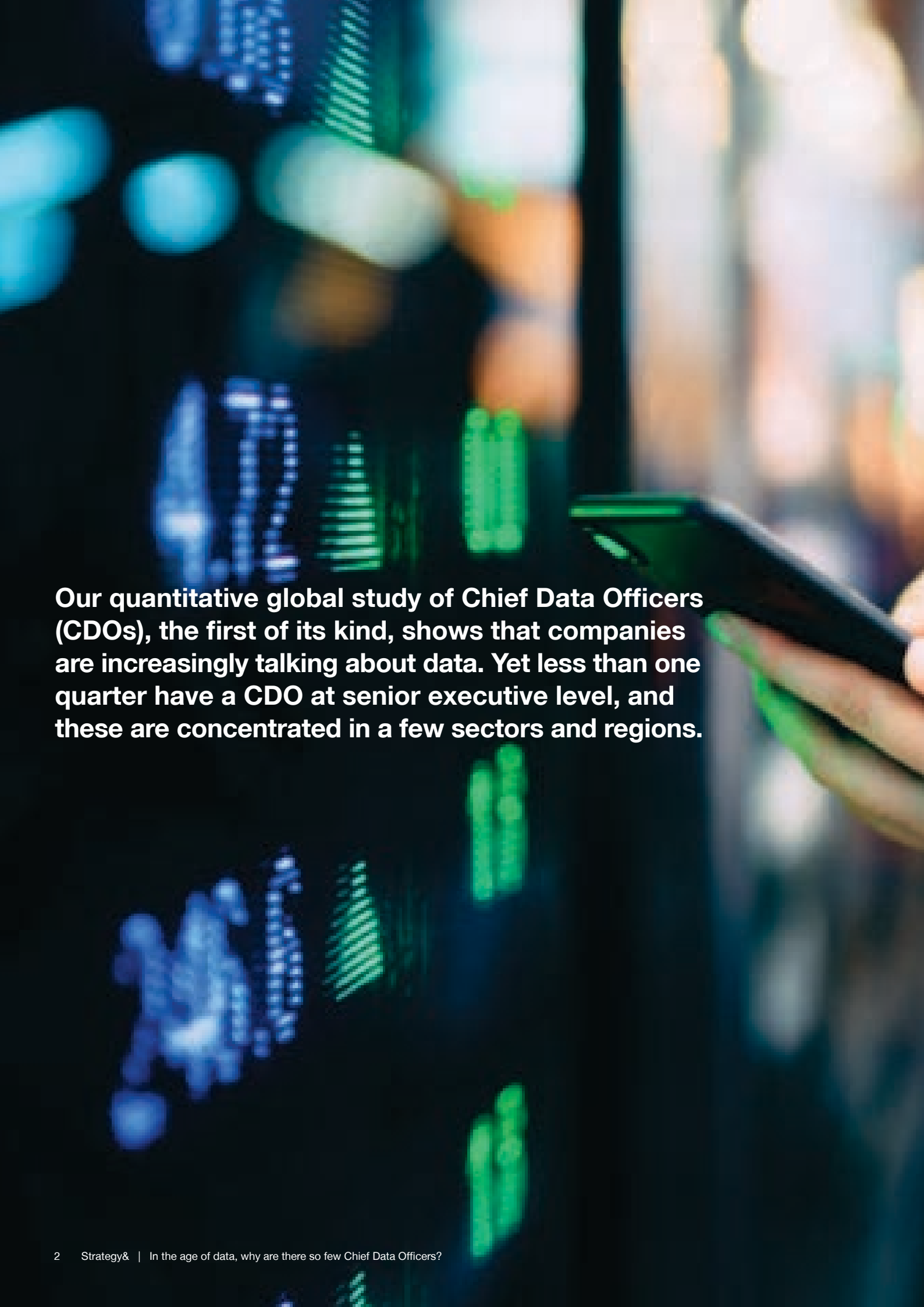
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Our quantitative global study of Chief Data Officers (CDOs), the first of its kind, shows that companies are increasingly talking about data. Yet less than one quarter have a CDO at senior executive level, and these are concentrated in a few sectors and regions.

EXECUTIVE SUMMARY

Over the past decade, data has begun to transform every area of social, economic and corporate life. The scale of data available for businesses to harness is growing exponentially, driven by the rapid adoption of cloud technologies and the proliferation of connected personal and work devices in homes, stores, offices and supply chains.

Companies seeking to capture lasting value from this transformation need to understand, process and manage data and algorithms intelligently and efficiently, while addressing public ethics and privacy concerns and complying with regulatory standards. **Yet most businesses have found adapting to this reality harder than anticipated**, especially when introducing artificial intelligence (AI) applications.

49%

Nearly half of all business leaders in PwC's latest annual Global CEO Survey say they plan to increase their investment in digital transformation by 10 percent or more over the next three years.



40%

Employees are increasingly willing to seize the opportunities of a data-driven future – 40 percent of PwC's 2021 Global Hopes & Fears survey group say they improved their digital skills during the pandemic.



80%

Of employees are confident they can adapt to new workplace technologies.



Against this background, a new senior executive role has emerged over the past five years – the Chief Data Officer (CDO). Much has been written about the role a CDO can play in maximizing the operational and commercial potential of data. Ironically, though, there has been a dearth of data tracking the rise of the CDO.

To understand the situation better, we have conducted a detailed, quantitative study of the prevalence and role of CDOs at the world's 2,500 largest publicly listed companies. We defined CDOs as a single person at C-suite level or one level below, with responsibility for the company's strategic approach to data. This definition reflects our belief that appointing a senior level CDO is essential for leadership teams seeking to maximize the potential of data as a strategic asset throughout the organization.

We also investigated the prominence of data on corporate agendas, and the corresponding influence of CDOs, using natural language processing searches across the past five years of annual reports for 1,000 companies worldwide.

There were four key findings from our study into the relevance and role of Chief Data Officers which highlighted striking and surprising trends

1

Companies are talking the talk on data: Two-thirds of companies are talking more about data to shareholders today than five years ago. On average, this group of companies mentioned data 52 times in their most recent annual reports, while the frequency of data references has increased by more than 15 percent in each year since 2017.

Our perspective:

- Shareholder expectations on creating or protecting value from data are being raised each year as data becomes more visible on corporate agendas.
- Demand will consequently increase globally for more companies to install accountable and effective CDOs.

2

Companies are not yet walking the walk with CDOs: The position is still emerging as a recognized executive level role, although it is rising rapidly in prominence. Only 21 percent of the top 2,500 publicly traded companies worldwide currently have a CDO in place. However, there has been a noticeable increase in the past two years. Almost half of all CDOs have been appointed since 2019, while three out of five are now at C-suite level, with oversight of enterprise-wide data.

Our perspective:

- The CDO role is proliferating and gaining recognition as an influential executive position.
- This trend suggests we are entering an era that will define if the Chief Data Officer persists permanently and continues to be a valued executive role, and how their most common responsibilities evolve.

3

There is a marked concentration of CDOs within a limited range of industries, regions, company sizes and personal backgrounds: financial services companies have set the pace so far, with CDOs in place at more than 40 percent of banking and insurance companies. CDOs are also a distinctly trans-Atlantic phenomenon: more than four out of five CDOs are at companies based in North America and Europe. Furthermore, CDOs are most likely to be found in companies with more than 10,000 employees and more than \$5bn in annual sales. Lastly, the archetypal CDO is overwhelmingly male, with a technology background, and more than 20 years' professional experience.

Our perspective:

- Some markets and companies will capitalize on a first-mover advantage for CDO talent, influence and data value creation, providing they shape and adopt the CDO role effectively.
- Fast-followers will need to assess how soon they will require a CDO and how to attract or grow this capability.
- In the short term, the market needs more diverse CDOs with a wider professional background.

4

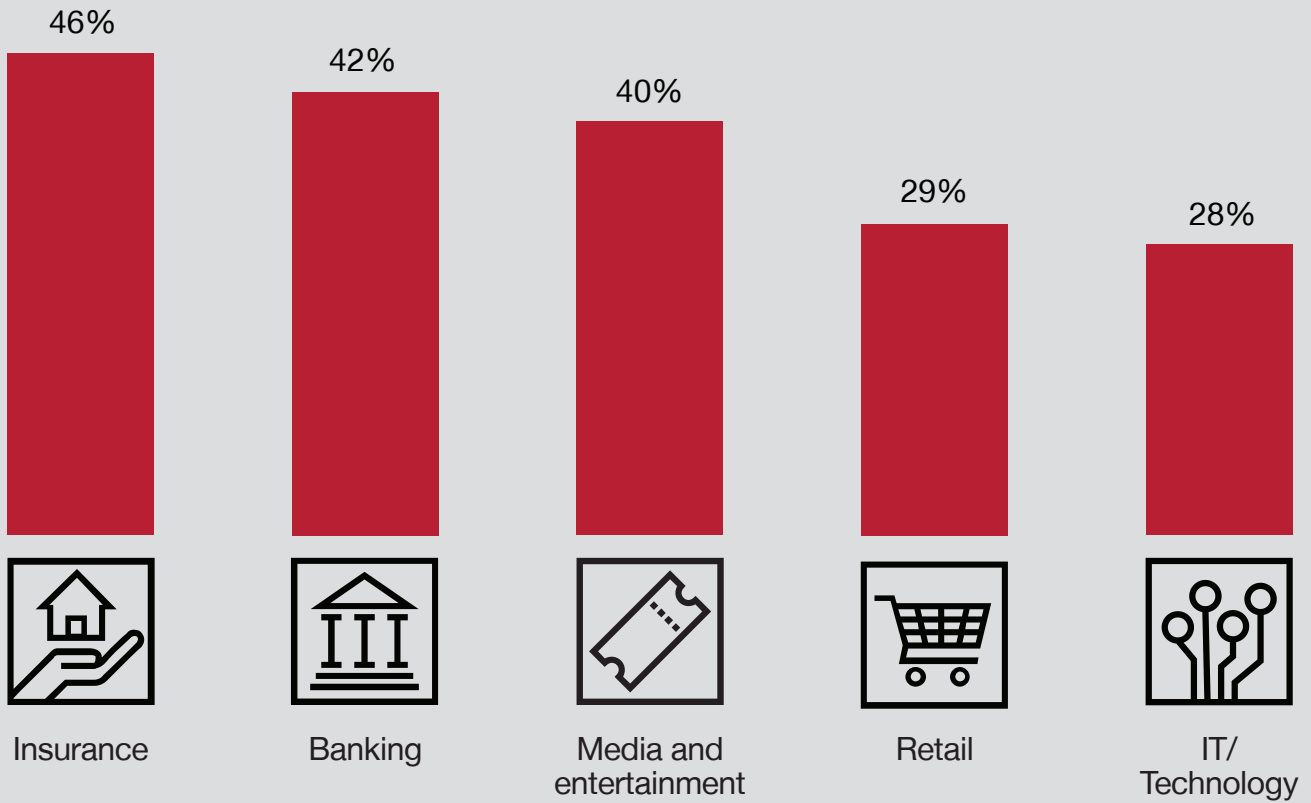
The presence of a CDO influences how companies talk about data and how frequently: companies with a CDO mentioned data around 30 percent more frequently in their reports, compared to those without a CDO. Overall, companies are twice as likely to refer to data “defensively”, in terms of security, regulation or governance, than in the context of “innovation”, in areas such as value and growth. That gap is widening every year, and the rise of the CDO appears to have contributed – companies with a CDO talk about data defensively 10 percent more frequently than those without a CDO.

Our perspective:

- CDOs are making a difference in highlighting the role of data more prominently in investor communications.
- Whether it is correlation or causation, the role of CDOs is amplifying companies' external presentation of their data narrative – and making it more defensive in tone.
- Businesses will need to strike a better balance between data defensiveness and innovation to capture the future potential of data, with CDOs shifting their priorities to drive that shift.

These findings provide the departure point for an informed debate about the role and purpose of a CDO in increasingly data-driven organizations. We set out in more detail below why companies and CDOs have reached a moment of truth and identify the critical questions they need to address.

Top 5 industries with a CDO in place



65% of companies are **talking more** about **data** compared to five years ago, ...



... but they are **2x** likely to **talk** about data in a **defensive manner** as in an innovative manner ...

... and **79%** still **do not** have a **CDO** in place.

What a Chief Data Officer brings to the C-suite



Engages the CEO and ensures board-level attention and recognition for data strategy and management



Defines the company's data strategy and how it supports wider corporate strategic and business goals



Custodian of proprietary data and manager of relationships with ecosystem partners for data acquisition, sharing and commercialization



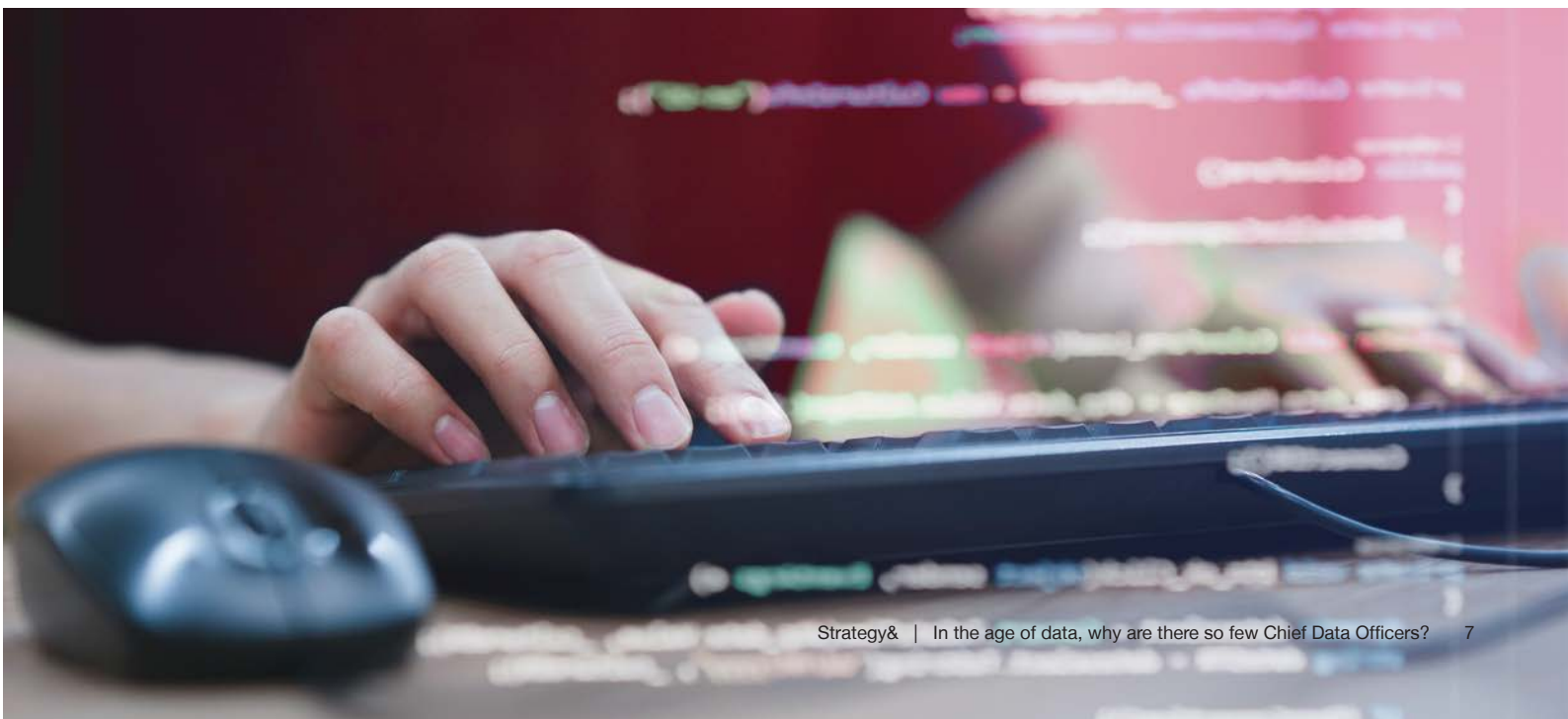
Drives or supports enterprise-wide strategic data initiatives such as business intelligence, analytics and machine learning which cut across organizational and functional silos



Oversees employee upskilling programs aimed at building broader and deeper data capabilities throughout the enterprise



Accountable for and monitors data quality and governance across the company, covering principles, policies and procedures, and regulatory and legal compliance



FOUR KEY FINDINGS IN DETAIL

1. Companies are talking the talk on data

Our keyword analysis of annual reports for 1,000 companies confirms that data features more strongly in presentations to investors today than it did five years ago. That confirms our expectations, given that all companies need to keep pace with the wider proliferation of data across society.

To understand this trend, we measured data frequency – the number of times a company referred to data or data-related terms in its annual investor reports, including the terms analytics, machine learning and AI. Our analysis showed that a typical company now refers to data 48 times in its annual report, although the frequency ranged widely between companies, from as low as one or two mentions, to as high as 200 times per report.

We found that two-thirds of all companies in the study have driven an overall growth in data references since 2017. Data frequency at these companies has increased by 78 percent since then. If that growth continues at around 15 percent per year, the same companies will refer to data on average more than 100 times in their 2025 annual reports.

Annual reports have also been getting longer, with the typical report now 103,000 words versus 89,000 words five years ago, including new important topics such as ESG and the impact of Covid-19 receiving prominent coverage. Yet data frequency has increased proportionately. In the most recent reporting period, data was mentioned on average 4.6 times per 10,000 words, up from 3.9 times per 10,000 words in 2017.

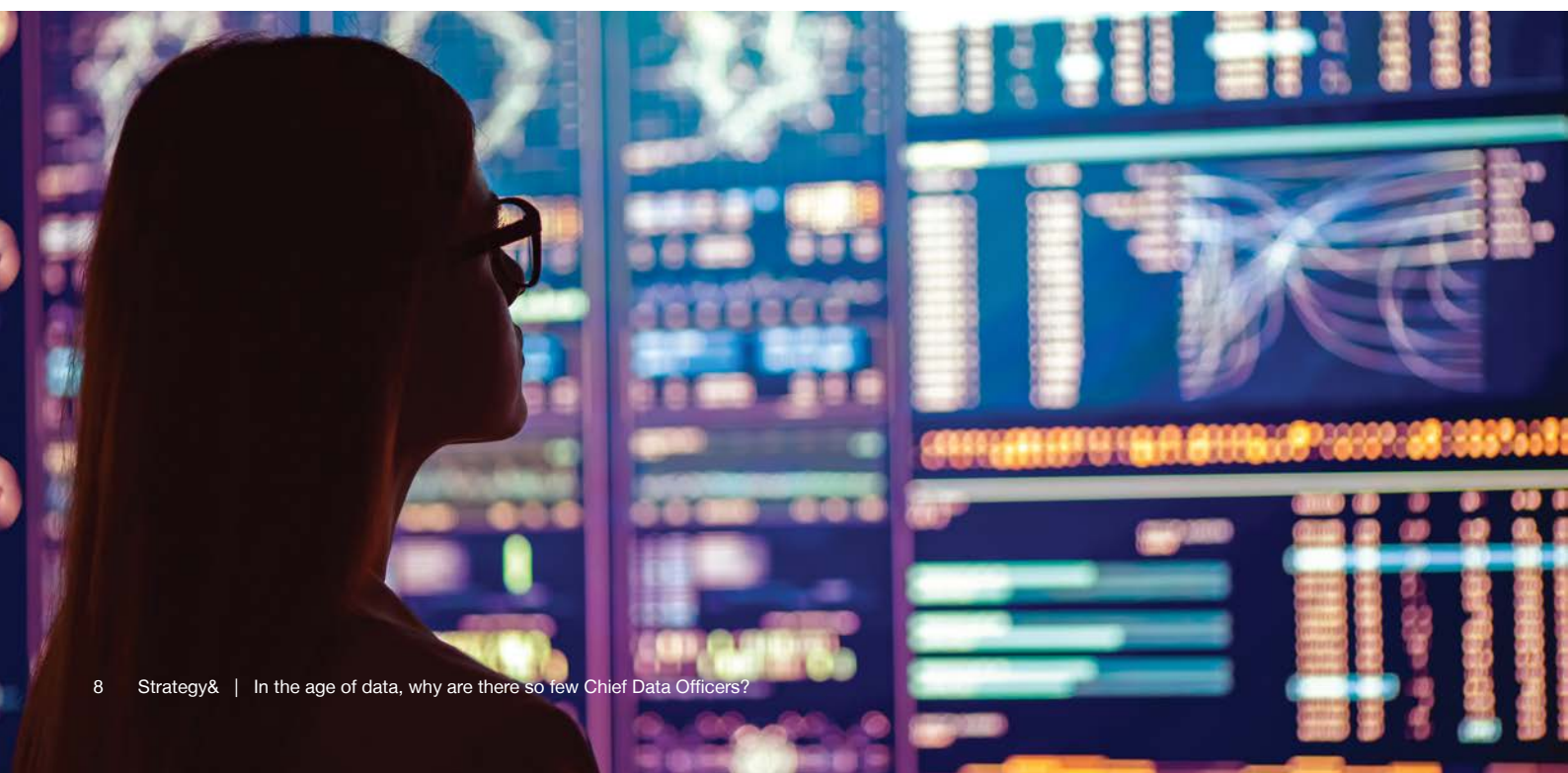
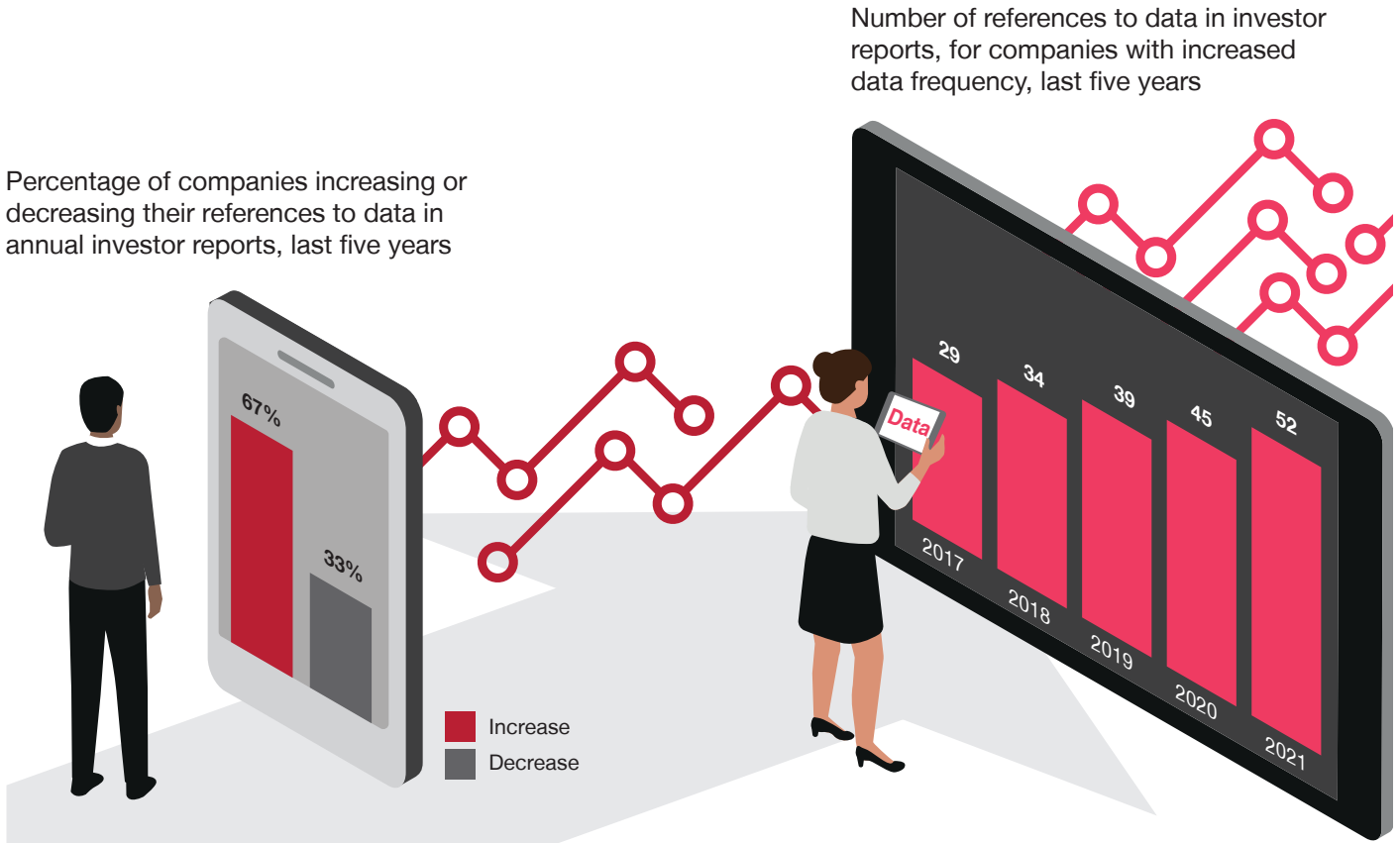


EXHIBIT 1
Data frequency



Source: Strategy& analysis



Data features more strongly in presentations today than five years ago. A typical company now refers to data 48 times in their annual report, an increase of 78 percent since 2017.”

2. Companies are not yet walking the walk with CDOs

Globally, we found that 530 companies, or just 21 percent of the total study, currently have a CDO. This small proportion can be seen in a positive light, given that even five years ago, the position was relatively rare. Furthermore, three out of five CDOs are now members of the C-Suite with oversight of enterprise-wide data, suggesting that boards and CEOs are beginning to make a single executive accountable for data success.

EXHIBIT 2A

CDO penetration

Percentage of the world's largest 2,500 companies by market value with a CDO



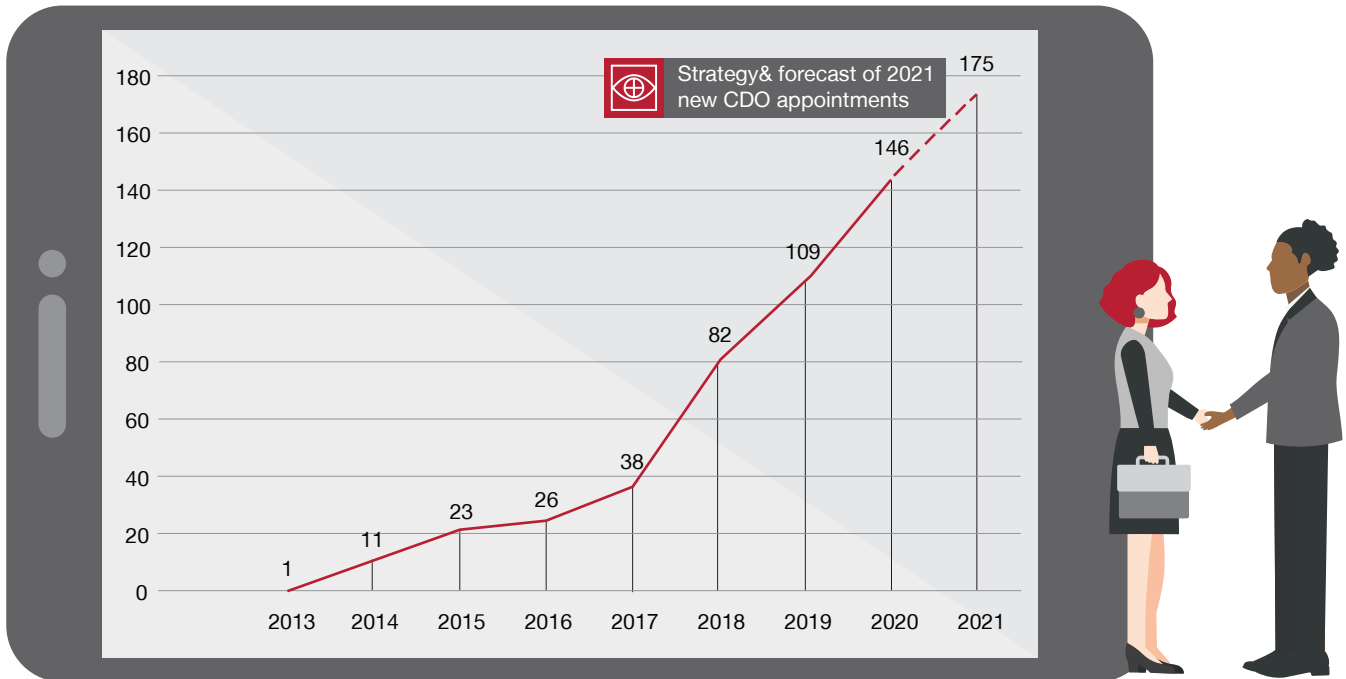
Source: Strategy& analysis

That still leaves the question of why most of these companies do not have a CDO, given the increasing prevalence of data themes in investor presentations, especially where companies have a well-defined strategic data agenda. There are several possible explanations:

- The CDO role is still relatively new, compared with other traditional C-suite positions such as Chief Marketing Officer, Chief Financial Officer and Chief Technology Officer. Awareness of the position and value of CDOs and a lack of suitably experienced candidates may be hindering appointments.
- Some companies mandate another executive, such as a Chief Digital Officer, or Chief Information Officer, to oversee data and other parts of the CDO's role. In our experience, doing so often dilutes the focus on data because other priorities compete for attention, budget and leadership.
- Many companies have also dispersed ownership of data throughout their organization. We identified more than 500 different role titles for the most senior data leader at companies without a CDO. This approach creates bureaucratic overlap, confusion about who "owns" data, and a lack of consistent market benchmarks on best data practices, hindering the establishment of a genuine CDO.

EXHIBIT 2B**CDO appointments**

Number of CDOs appointed by the world's largest 2,500 companies by market value, 2013-2021



Source: Strategy& analysis

Amid this complexity, some facts are becoming clearer from our research and engagement with clients. The prevalence of CDOs in most industries is steadily improving; since 2016, CDO appointments have increased on average by around 50 percent each year.

It is striking that 255 CDOs – nearly half of our identified CDOs – were appointed in 2019 and 2020. Given the trajectory in the first half of 2021, we expect a further 175 CDOs to have been appointed by the end of the year.

In the aftermath of Covid-19, the question is whether the upward trend continues or subsides over the next five years. If the growth rate is sustained, we estimate that almost half of all 2,500 companies could have a CDO by 2025.

3. There is a marked concentration of CDOs within a limited range of industries, regions, company sizes and personal backgrounds

Financial services have set the pace so far in CDO growth. More than 40 percent of banking and insurance companies in 2021 have a CDO, while 23 percent of all CDOs globally are employed by banks. Financial services sector companies are more than twice as likely to have a CDO than utilities, real estate or automotive companies, all of which have less than 15 percent CDO penetration despite a clear strategic need to capture and deploy data at scale.

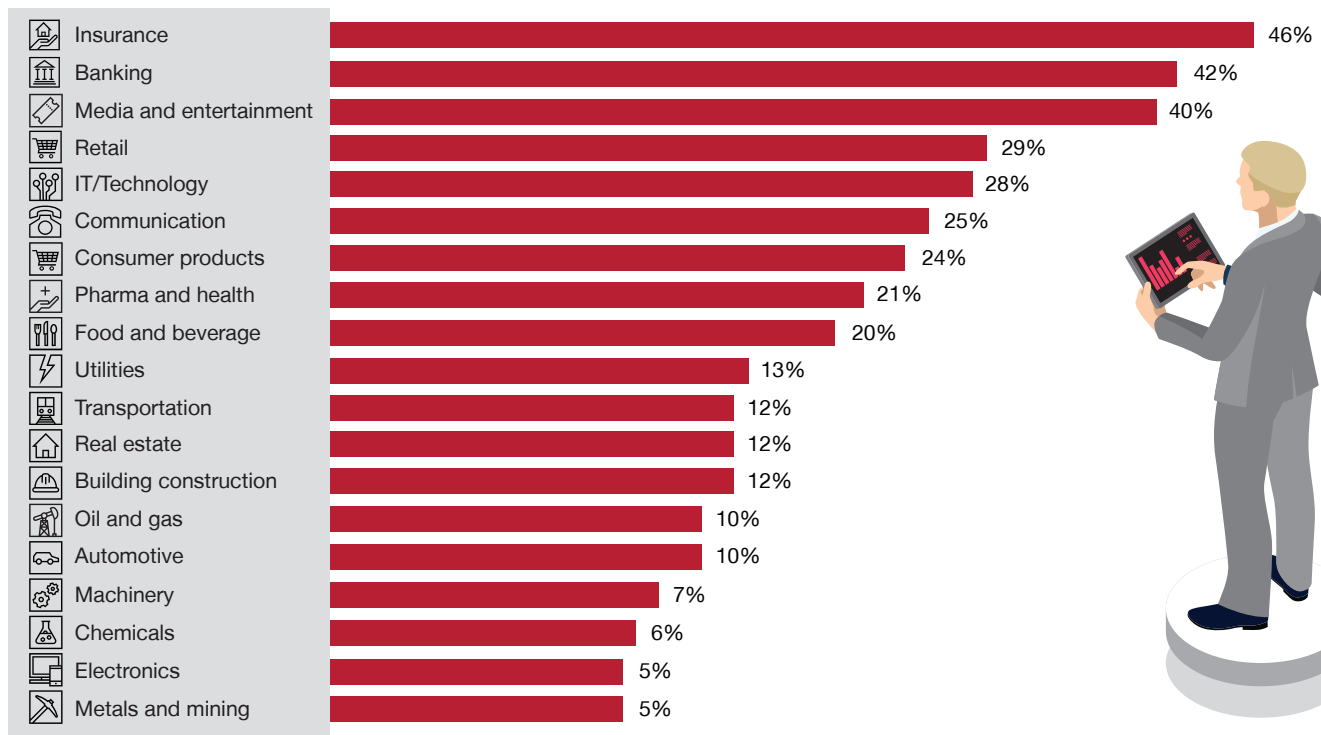
We believe the higher proportion of CDOs at banks and insurers reflects the stricter regulatory regime for financial services companies, which requires highly qualified specialists to manage and anticipate data risks. The relative dearth of CDOs in other sectors is less easily explained. It may reflect varying definitions of the CDO's role within individual companies across different industries.

CDOs are also a distinctly trans-Atlantic phenomenon: one third of companies in the study that are based in North America have a CDO, as do one quarter in Europe. Globally, more than 80 percent of CDOs work for companies in North America or Europe, including around half in the US.

EXHIBIT 3A

CDO penetration by industry

Percentage of companies within industry sectors that have a CDO



Source: Strategy& analysis. (Note: Industries with less than 40 companies (n<40) are excluded)

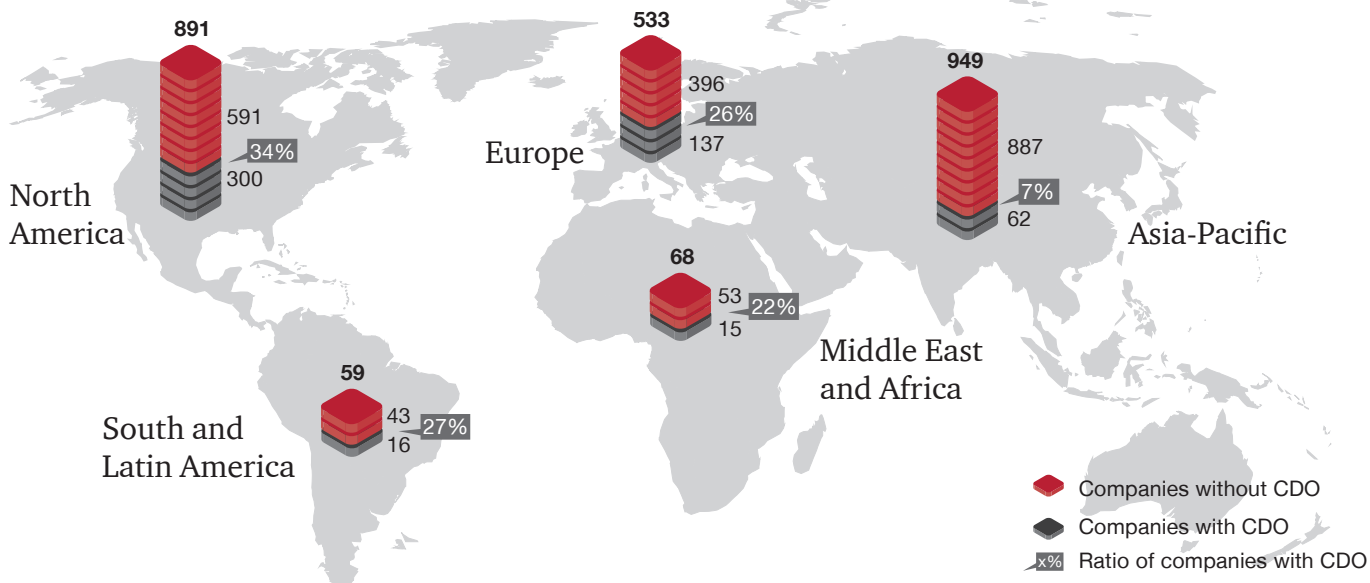
It is easy to understand the attraction of US companies to ambitious CDOs looking to make progress in their career, given that the US remains in the vanguard of the global data revolution. The increasing prevalence of CDOs in Europe may in part be due to some of the world's most stringent data protection regulations – notably, the EU's 2018 General Data Protection Regulation (GDPR). There are some surprising national variations within Europe which we intend to examine further in future research, such as a relatively low proportion of CDOs in Germany where only 18 percent of companies have appointed the role.

The 7 percent CDO ratio for Asia Pacific companies lags far behind other regions. Overall, companies based in the Asia Pacific region are five times less likely to have a CDO than companies in North America. Among APAC countries, companies in Australia have the highest ratio of CDOs (24 percent), followed by India (15 percent).

At first glance the scarcity of CDOs in China seems puzzling, given its dynamic, globally powerful tech sector. There are just six CDOs at China-based organizations, out of a total national sample of 384 companies. However, an increasing proportion of state-owned and private sector companies do have a senior executive with business-wide responsibility for data management and oversight. This trend suggests formal CDO appointments could increase in the future, as the role gains more traction in China.

Regardless of their location, companies with a large payroll and multibillion dollar revenues are more likely to employ a CDO than smaller organizations. Clearly, large organizations tend to generate and consume more data and are arguably more inclined than smaller businesses to see data as a strategic asset. These characteristics may in turn increase the perceived need for a CDO. The tipping point for early adopters of the CDO role appears to be companies with more than 10,000 employees and more than \$5bn in annual sales. Overall, businesses with more than 200,000 employees have the highest CDO ratio at 48%, followed by 38% of companies with annual sales of more than \$50bn.

EXHIBIT 3B
CDO penetration by region
 Percentage of companies that have a CDO, by headquarter region



Source: Strategy& analysis

4. The presence of a CDO influences how companies talk about data and how frequently

CDOs appear to be making a difference in highlighting the role of data more prominently in investor communications. In their last reporting year, companies with a CDO in our qualitative analysis of 1,000 companies mentioned data on average 30 percent more frequently than those without a CDO.

We also assessed the sentiment and context of data references in company reports, using keywords in close proximity to these references to identify common subjects that most companies talked about, most of the time. There were two noticeable themes, which we call “Data defensiveness” and “Data innovation”.

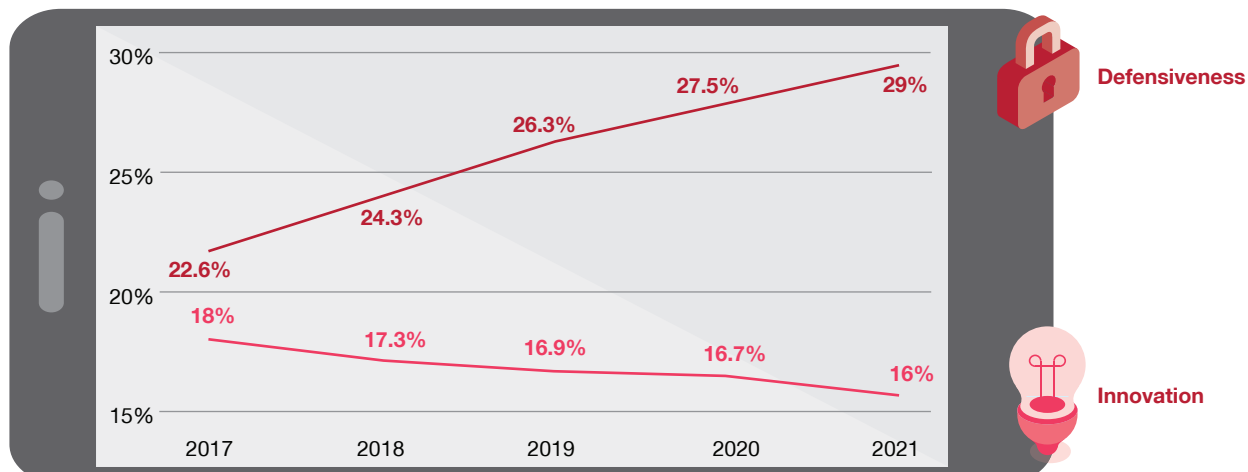
- Data defensiveness refers to mentions of data in the context of data security, regulation and governance – in essence, defending the company against cyber attacks, leaks and other risks.
- Data innovation refers to mentions of data in the context of creating new value, customer experience and business growth – that is to say, helping the company to address and transform market opportunities.

On average, the 1,000 companies that we analyzed are twice as likely to talk about data defensiveness in their annual reports versus data innovation. Moreover, that gap has been widening every year since 2017. We also found that companies with a CDO on average referred to data 10 percent more frequently in a defensive manner than other companies, while the frequency of innovation references was the same. This makes sense, given the increased public and regulatory scrutiny of the use of data by businesses, with clear financial consequences for businesses which breach data privacy and security rules. CDOs can use the need to reassure markets and the public regarding the company’s strong oversight governance of data to gain credibility in the C-suite.

EXHIBIT 4

Data defensiveness versus data innovation

Percentage of data references in investor reports in the context of data defensiveness vs data innovation, last 5 years

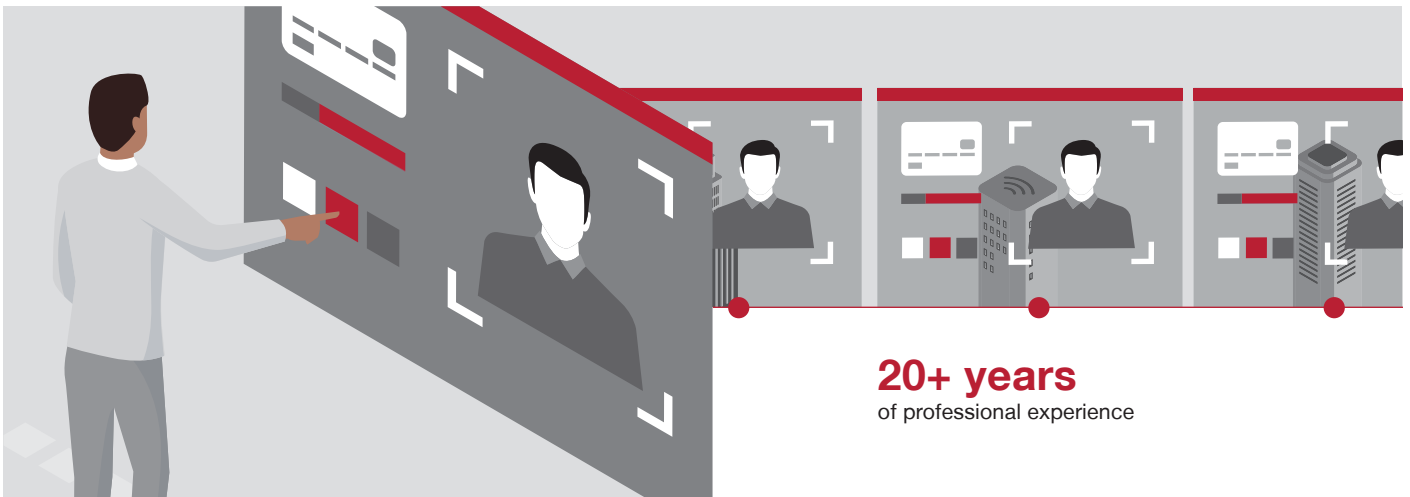
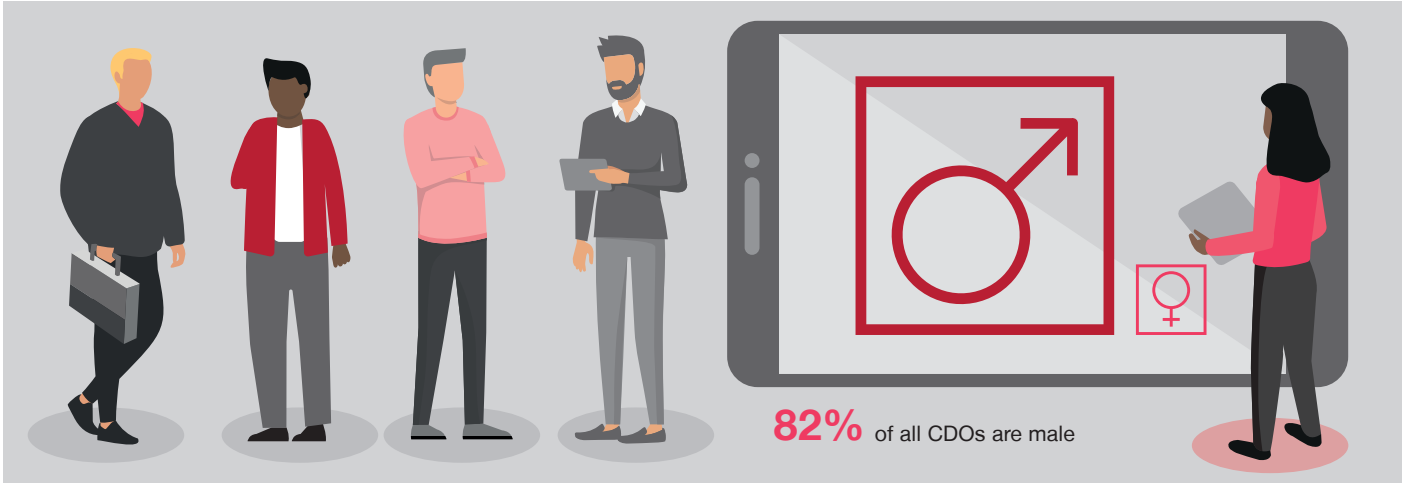


Source: Strategy& analysis

EXHIBIT 5

Who is the typical CDO?

There is a concerning lack of diversity among CDOs globally across industry sectors



Source: Strategy& analysis

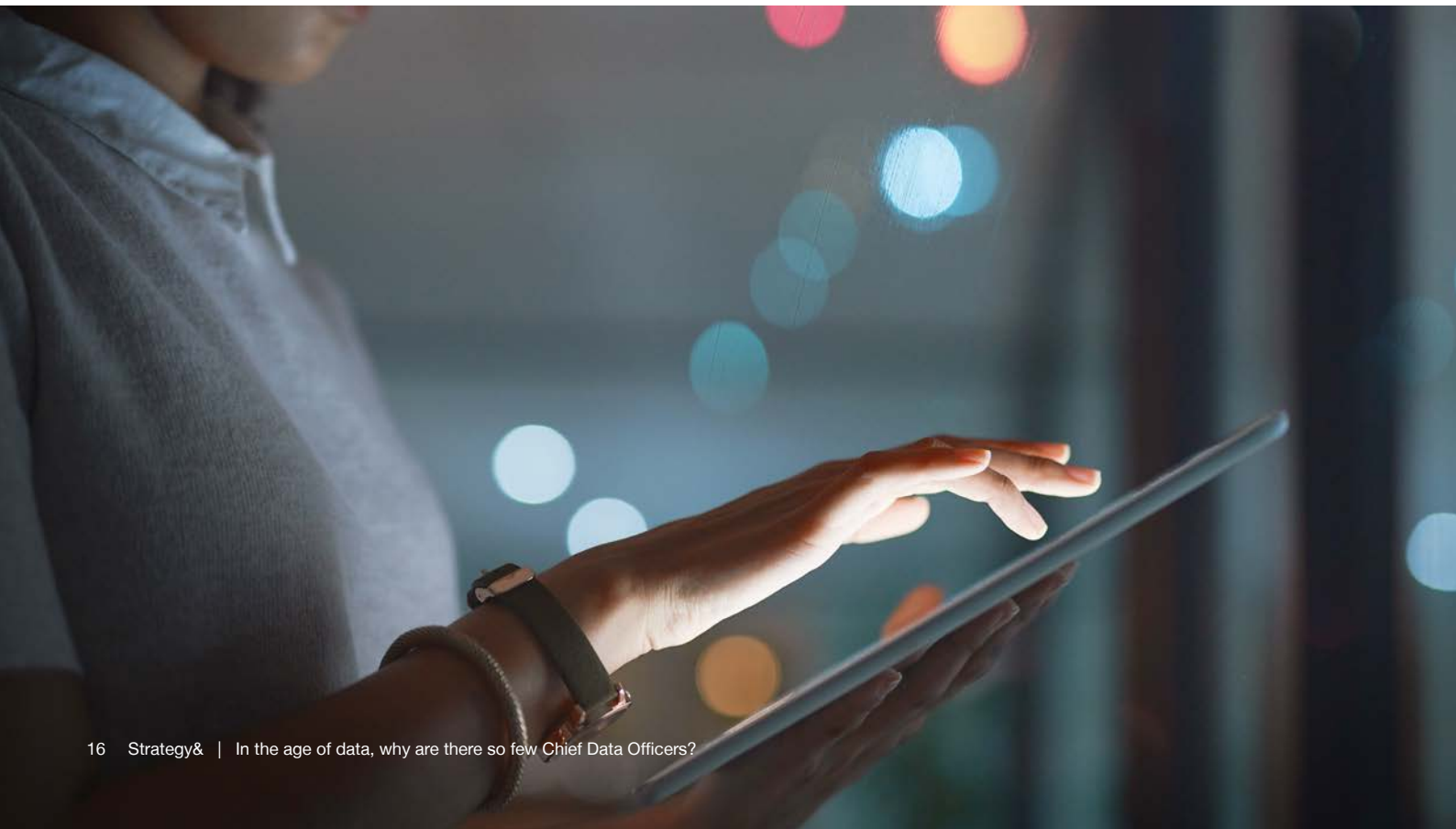
CONCLUSION – KEY QUESTIONS TO ADDRESS

Hot and getting hotter? The future of the CDO market

The CDO role is starting to gain proper traction in some key markets, against a background where data is proliferating, and data-based technologies are evolving at pace. More and more companies are “talking the talk” on data more frequently with shareholders, which in turn is a potential driver of demand for new CDOs with wider executive remits. At the same time, the concentration of CDOs in North America and Europe is a potential inhibitor of CDO growth worldwide, as is the lack of CDO diversity.

We believe that the rise in CDO appointments in the last two years suggests that the CDO role will continue to grow in the near term – but by how much, and for how long, is uncertain, especially given that companies are still absorbing the unprecedented impact of Covid-19.

Ahead of next year’s study, we will explore in more depth the evolution of the role in a series of regional and sectoral reports, and assess how companies can more readily utilize data to gain competitive advantage. **Based on the results of this first CDO study, we recommend that companies should address a series of critical questions, regardless of whether they have already appointed a CDO or are just examining how to define this role. We have also identified key questions for current and aspiring CDOs to consider, listed on the following page.**



CDOs: Key questions to address

Companies with a CDO today

- Does your CDO have a seat at the top table, empowered to capture all the value available with data? If so, you are first-movers in this space – consider how you support your CDO to drive a competitive advantage in your region or market segment before others catch up.
- Are you balancing your CDO's focus, between data defensiveness and data innovation? Where are the areas of untapped potential with data that your CDO should be building long-term value from once the foundations of data management and security are in place?
- How will you measure the impact of your CDO on the organization over time? What transformational benefit will your CDO deliver and how will you continue to articulate that to investors and stakeholders?

Companies without a CDO

- Do you consider your company's strategic objectives to be more or less reliant on data today? What will your trigger point be to appoint a CDO, be that regulatory, size or complexity of your business?
- How quickly can you adapt to the CDO model? You are at risk of losing a race for talent given the relatively small gene pool of CDOs today. How will you attract and develop a CDO when you hit your trigger point?
- How will you contribute to a greater diversity of CDOs when you make an appointment? Can you influence a new archetype CDO persona that could reshape the role for the next 5 years?

For current or aspiring CDOs

- Consider the scale and location of the company you work with today (or are seeking to join). Can you build long term success as a CDO in that market?
- Focus on formalizing your executive responsibility for data success – do not accept being away from the top table or not having a voice, especially where your company is talking about data to shareholders more frequently each year.
- As you grow into the CDO role and shape your influence, how can you build wider communities, create KPIs for the CDO office and benchmarks and standards, and overall trust and confidence in the position?

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