



A new era of leadership in energy and resources:

The DNA of the Chief Data Officer



Building a better
working world

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Introduction

By 2025, global data creation is expected to reach 175 zettabytes¹ and the global big data and analytics market is on pace to reach \$135.71 b.² Data will fuel global economic development throughout the remainder of the 21st century. Organizations worldwide are scrambling to reengineer their data strategy to capture increasing amounts of data, translate it into actionable insights and ultimately empower more intelligent business decisions.

Several industries, including technology, banking and consumer goods, have already integrated transformative data initiatives into their strategic approach. But Canadian energy and natural resource (ENR) industries have only just started to fully appreciate the true value of data moving forward:



Oil and gas

The Canadian oil and gas (O&G) sector has historically generated significant and consistent cashflows, reducing the immediate need to develop new data-based competitive advantages. However, unpredictable fluctuations in oil price, global recessions and the transition to renewable energy have pushed most O&G leaders to prioritize developing data competencies that optimize costs and grow revenues.³



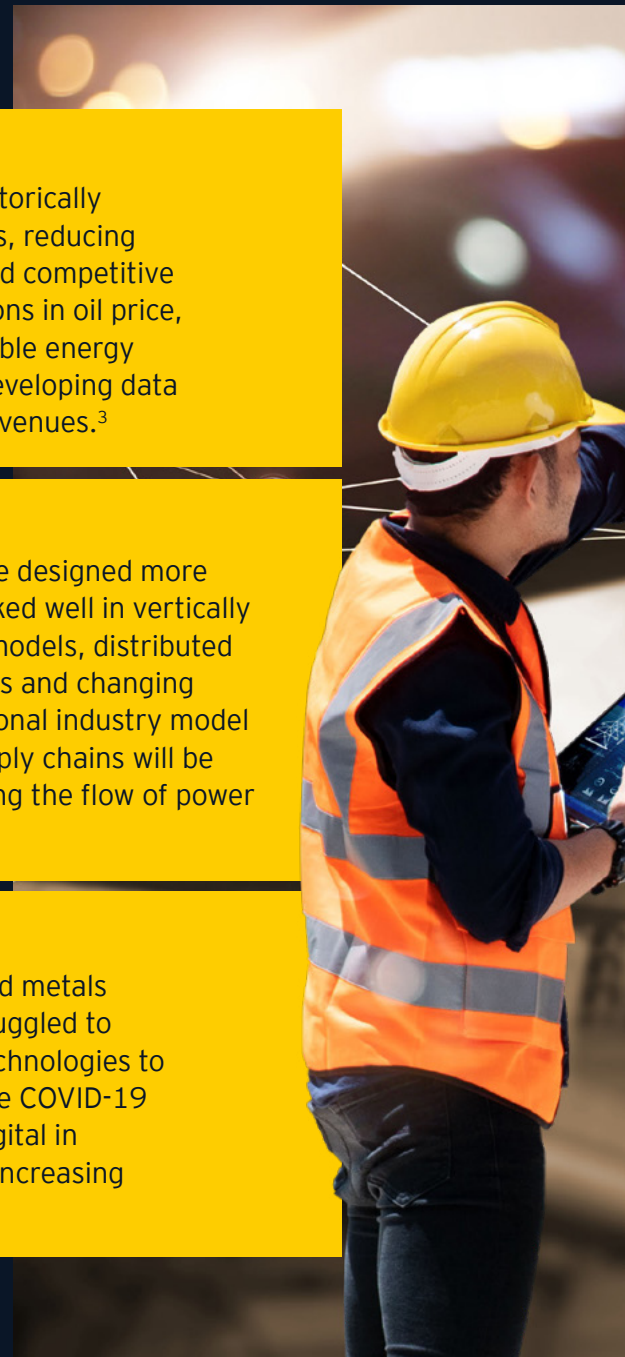
Power and utilities

Canada's power and utility (P&U) systems were designed more than 100 years ago. While these systems worked well in vertically integrated and centrally supplied generation models, distributed renewable generation, new digital technologies and changing consumer expectations are turning the traditional industry model upside down. The future of Canadian P&U supply chains will be interconnected by digital technologies, enabling the flow of power and data in both directions.⁴



Mining and metals

There is lots of data available in the mining and metals (M&M) industry, but M&M companies have struggled to figure out how to deploy, use and integrate technologies to achieve their strategic priorities.⁵ However, the COVID-19 pandemic highlighted the huge potential of digital in the M&M space and many companies plan on increasing investments in digital transformation.⁶



The single most effective step Canadian ENR companies can take to reengineer and catalyse their data strategy is to hire an effective Chief Data Officer (CDO). EY teams developed this report to examine how an effective CDO is the foundation for building any transformative, digital and data-driven capabilities in a Canadian ENR organization.



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CDO defined

The CDO is one of the newest potential additions to an organization's senior leadership team.⁷ At its core, the CDO role is about determining how data is used and governed throughout the organization.

According to research from NewVantage Partners, the CDO role comprises seven critical job types,^{*} each of which is so distinct that it may require more than one person to do them all well.⁸ Organizations must ask themselves, "what do we need the CDO role to be based on who we are, where we are and the industry or market context in which we currently operate?" A one-size-fits-all approach won't work.

The seven job types under the CDO umbrella are:



Data and Analytics Officer: In this role, the CDO is expected to manage the enterprise's data science and analytics functions, including artificial intelligence. Proper data management allows organizations to conduct effective analytics and derive insights to create business value. CDOs who are responsible for analytics typically have little bandwidth for additional accountabilities, so some organizations opt to have a dedicated Chief Analytics Officer (CAO) as well as a CDO.



Data Entrepreneur: Companies are starting to ask CDOs to monetize data, either by selling it externally or using it internally to create new value-generating opportunities. This role requires a strong background in business and new product and/or service development, which are not typical attributes of technology-oriented and data-driven CDOs.



Data Developer: Organizations typically need robust data applications and infrastructure capabilities to help generate tangible business value. Data application or system development is demanding and requires expertise across technology domains, project management methodologies, stakeholder management and integration with organizational systems and processes. Although application development naturally rests with CIOs, developing data-specific applications requires a CDO's specialized knowledge and expertise. In most instances, organizations achieve the best results from application development through collaboration between the CDO and CIO.



Data Defender: With data breaches and fraud becoming increasingly common, protecting data is an important task. The risk is high, with financial damages in the form of fines from regulatory authorities and non-financial damages such as loss of reputation and customer trust. While many CDOs are still responsible for data security, recent technological advancements have led to a new role, the Chief Information Security Officer (CISO). Leaving data security to the CISO allows CDOs to focus on other critical tasks, such as developing sound data infrastructures and enabling analytics to derive value from organizational data.



Data Architect: Several organizations need to modernize and upgrade their data environments to unlock the potential of their data. Such modernization efforts need architectural upgrades, which tend to be resource intensive and take a significant amount of time to realize any tangible value for the organization. A significant challenge for the CDO is convincing senior executives to look beyond the short-term upside, which requires advanced stakeholder engagement skills.



Data Governor: Data governance is typically seen as one of the critical tasks of a CDO. CDOs must understand how the data strategy and the underlying data governance can strengthen an organization's overarching strategy. Expertise in data governance, business strategy, organizational change, and how each of these components interacts with one another is critical for any CDO to be successful.



Data Ethicist: The ethics of data management is becoming a prominent topic in the business world, and an increasing number of CDOs are placing significant importance on its inclusion in their organizations' data strategy. This job is related to managing how data is collected, protected, shared and controlled. With increased scrutiny from both consumers and lawmakers, a deep consideration of ethics and an astute understanding of the rules and regulations are essential to do this job well.

Depending on the organization's needs and the market context, the CDO's role may differ from one business to the next. but ultimately all CDOs are expected to derive the maximum business value from the data available to the enterprise.

^{*} These job types summarize some of the different responsibilities that can be assigned to a CDO (i.e., the different "hats" they may have to wear in an organization).

CDO role in the Canadian energy and natural resources sector

Evolving scenarios projected by the Canadian Energy Regulator indicate that energy usage, particularly non-renewable energy, across the country will continue to gradually decline through 2050.⁹ This decrease in non-renewable demand can be attributed in part to improved energy efficiency, the slow but steady electrification of Canada's transportation sector, and the increasing prevalence of carbon pricing policies.¹⁰

Although the future state of the Canadian ENR sector remains to be seen, this downward pressure on demand could intensify the myriad of challenges facing organizations across each industry.

Canadian ENR companies have found ways to overcome these obstacles in the past, but with energy and commodity markets becoming increasingly more volatile, they need to find a way to transition their business strategies to be more adaptable to market trends. This shift in mindset will require ENR companies to consider redefining the role of their CDO to ensure their data assets are effectively empowering their business objectives.





Oil and gas insights

Data is not well understood

The O&G industry has become more interested in using data analytics recently, but there are still challenges associated with an overall lack of support and understanding surrounding big data.¹¹

O&G companies know the importance of data and how it fits into transformation initiatives, but they struggle to get the ball rolling – how to run a program cleanse data, prioritize the right information and build a data transformation strategy from that point. Installing an experienced CDO will help develop these essential competencies and ultimately deliver more effective data strategies and transformations.

Functions, and therefore data, operate in silos

A huge amount of data is generated as oil and natural gas pass from upstream to downstream, but O&G corporations lack a clear understanding of how best to leverage data from one part of the company to another.¹² This data is commonly stored across a wide array of different systems in different functions, both manual and computerized. Since functions tend to work and operate in silos, data is never used to its full potential. CDOs can help unify and integrate data from across the enterprise to empower more insightful analysis and decision-making.

Advancing the energy transition is needed

One of the topics of conversation for the 2022 Calgary Chamber of Commerce Energy Summit was the need for a significant increase in technology investment to help drive the energy transition.¹³ Digitalization and data will be key to a successful shift to renewable energy, therefore, positioning the CDO as a steward, champion and enabling force behind the energy transition.¹⁴

Technology Officers (CDOs and CIOs) are not leading members of O&G companies

Many O&G companies haven't placed enough emphasis or authority in the CDO or CIO roles for them to effectively deliver new data-driven competencies.¹⁵ In some instances, the CDO has little say in data governance policies and is limited in their capacity to integrate the business and IT strategies together. For O&G companies to harness the power of data, the CDO needs to be given an appropriate level of authority over strategic decisions surrounding data, data governance and analytics.

Oil and gas: Benefits and opportunities realized through the CDO role



Data analytics can be used to capture real-time data for improving production efficiency, reducing emissions and lowering costs.¹⁶



Applying data analytics can locate new sources of oil and gas without having to perform dangerous procedures, reducing risk and protecting human safety.¹⁶



Data analytics enables higher accuracy in drilling and exploration using seismic data to evaluate possible drilling locations.¹⁶



AI and data analytics can help improve the efficiency of machine performance through predictive and preventative maintenance.¹⁶



Increased use of data analytics can be a recruitment tool to excite the younger generation and attract new talent.



Power and utilities insights

Customer usage forecasting is challenging

Forecasting usage and proactively predicting consumer needs is incredibly difficult in the P&U industry for several reasons, including:⁴

- ▶ P&U corporations serve millions of customers, each coming with unique needs and usage patterns.
- ▶ “Prosumers,” an increasing number of customers producing their own solar energy who are no longer simply users but also inputs into the grid, are adding an additional layer of complexity.
- ▶ Climate change is causing an increase in extreme and volatile weather events, leading to more spikes in demand and intense strains on the grid.

Setting up technologies that provide consumption data in real time and having a CDO who can apply that data through data analytics and AI to generate insights will be crucial to helping P&U companies predict usage and input to balance the grid.

Capital expenditures are high

Over CDN\$36 billion was spent on capital and repair expenditures (i.e., substations, transformers, etc.) in the Canadian P&U industry in 2021.¹⁷ This is a major challenge for P&U companies, especially if the capital allocation process is not always optimized to their unique market context and strategic imperatives.

AI and machine learning can be used to monitor physical asset conditions, optimize proactive maintenance and enable accurate trade-off information between different spend decisions.

Using data to understand how well assets are being run could be the key to enhancing asset productivity and lowering capital expenditures and operating costs. CDOs can act as the link between the business need and technology by identifying the data requirements and putting the most appropriate data strategies in place.

Customer service infrastructure needs to be updated

Digital technologies are giving P&U companies the opportunity to redefine the utility-consumer relationship.

Current customer information systems in Canada, which are used for metering and billing, are very basic and most have been around for 15+ years. While many companies continue to use these outdated systems, significant technological strides have been made during the past few years that have enabled better data organization, information segmentation and relationship management.¹⁸

One of the major developments is the introduction of advanced metering infrastructure (AMI), which is defined as an “integrated system of smart meters, communication networks and data management systems that enables two-way communication between utilities and customers.”¹⁹ Traditional meters would only be checked once a month, but AMI enables P&U companies to receive metering data multiple times in an hour. A 2016 study conducted by the US department of energy demonstrated that AMI could achieve substantial grid impacts and benefits for both customers and P&U companies.¹⁹

Updating the customer service infrastructure – and ensuring there is proper integration – will be crucial for P&U companies and will greatly improve their CDOs’ ability to make use of data going forward.

Increasing likelihood of power outages

Power outages cost billions of dollars every year and can have significant ramifications on customer satisfaction²⁰. The leading cause of power outages in the US and Canada is the weather, including high winds, heatwaves and winter storms. As climate change causes extreme weather events to become more common, outage prediction and management will become increasingly important for Canadian P&U companies.²¹

AI and machine learning can be used to predict and identify at-risk sites and assets to help prevent outages, and data generated by AMIs can be used to precisely dispatch repair crews for faster outage restoration.^{4,19} However, none of that will be possible without a competent and empowered CDO who would lead the charge on establishing, executing and sustaining a proper data strategy.

Power and utilities: Benefits and opportunities realized through the CDO role



Data analytics can be used for efficient and accurate consumption forecasting to enable better power generation planning.⁴



AI and data analytics can be used for better trade-off analysis on major spending decisions (e.g., site selection) and improve asset management decision-making.⁴



AMI and data provide both companies and customers with more information and control over energy consumption to be more energy efficient while reducing costs for metering and billing.¹⁹



AI and data can help reduce the impact of outages through predictive modeling and more accurate repair dispatching.^{4,19}



Mining and metals insights

ESG and decarbonization is a priority

In a study EY teams conducted on the Top 10 business risks and opportunities for mining and metals in 2022, “environmental and social issues” and “decarbonization” were listed as the number-one and number-two trends, respectively.⁶

AI and other data-driven digital technologies can enable diversification into greener products and improve reporting to boost safety, ESG transparency and sustainability while simultaneously reducing costs.²² M&M companies need CDOs to help make these transformational changes to drive long-term value for the organizations and the communities they serve.

Data is everywhere, but there is a lack of centralization and true insight

An ongoing issue with the M&M industry is that companies are not good at seizing and developing foundational aspects of connectivity. From data acquisition and governance to using cloud-based platforms to their full extent (which is central to connectivity), M&M companies either don’t know where to start or don’t know how to execute.²³ Until data is pieced together, it cannot be used to drive insights and decision-making.

CDOs can help ensure data is linked with data governance leading practice so that advanced analytics and machine learning can be leveraged to not only translate data into meaningful insights but to also take visualization of the data to the next level.

In the long run, the hope is that the data can enable the M&M industry to implement full digital twin* monitoring, which enables a more holistic, integrated understanding of how mines operate.²²

No real recognition in M&M of the CDO role today

One of the root causes behind the M&M productivity challenge is a “lack of ownership of the digital transformation agenda.”²⁴ Having a CDO who can take control of digital transformation strategy is crucial to focusing efforts on effectively building business capabilities using new digital technologies, data and analytics that generate new competitive advantages and create value.

Mining and metals: Benefits and opportunities realized through the CDO role



Data and digital technologies have already shown the ability to put M&M organizations ahead of the curve with investors through better ESG ratings, enabling access to a larger pool of attractively priced capital.⁶



Data analytics can be used to drive insights that lead to cost and time savings.²⁵



M&M companies need relevant, useable information to make informed decisions that improve capital productivity and create more reliable operations.²⁵



Predictive analytics can enable predictive maintenance, reducing downtime and boosting equipment efficiency.²⁵



Data analytics can be used to generate health and safety warnings, reducing risk.²³

Challenges of the CDO role

The CDO role is difficult and often unforgiving. The average tenure is between two and two and a half years, which is significantly shorter than the average C-suite tenure of nearly five years.^{26,27}

The most common challenges faced by CDOs are:

1

Lack of role definition

Since Capital One first introduced the CDO role, there has been a rapid growth in the number of firms with a CDO in place. But there's still not a well-defined, widely accepted definition of the role in terms of responsibilities, focus, purview and reporting relationships.²⁸ CDOs may lack clarity regarding which combination of the seven job types (see "What is a CDO?" above) they are responsible for when starting at a new firm, and it can take weeks, if not months, to ascertain what criteria they'll be assessed on.²⁹

2

Unrealistic expectations

The ubiquitous success stories on the creation and capture of business value through data analytics and AI has led to high expectations of CDOs. According to a recent study by the high-performance analytics database Exasol, nearly half of CDOs (46%) say that organizations' expectations of them are too high and are misinformed.³⁰

Organizations in early stages of their digital transformation – which includes most ENR companies – might take longer than other, more data-mature organizations to derive value from organizational data. Managing expectations from other senior executives is a crucial challenge for most CDOs.

3

Measuring data improvements in business terms

Advances in data infrastructure and data quality do not always translate to direct business benefits and are often invisible to other executives and users. Also, most CDOs lack C-suite experience and organizational leadership skills, which makes communicating their achievements to other senior business executives even more difficult. Their C-suite compensation levels and lack of well-developed C-suite political savvy often leave them vulnerable in their jobs from day one.

4

Handling cultural change

Digital transformations consist of

- 1) changing the organization's data infrastructure and data governance model and
- 2) shifting the organizational culture to make it more data driven.

Lack of change management experience, will present a significant challenge to the CDO role. Even if the CDO has established an optimal data strategy with great promise to move the corporate needle, traction against any of the critical technical changes will be slow and painful.

What makes a great CDO?

The prevalence of CDO roles has grown globally in many sectors. Nearly two thirds (65%) of data-intensive organizations surveyed in 2021 confirmed they had a CDO in place, up 53% from 2012 when the first generation of CDOs was hired.²⁸

It's clear that organizations are seeing the value in hiring a CDO – but what makes a CDO effective? What characteristics must a CDO possess to successfully govern an ENR organization's data while also contributing measurable value to the enterprise in the face of the challenges previously listed?

To aid ENR companies in the CDO selection process, we've identified four key characteristics that recruiters should focus on when assessing potential candidates. Of course, organizations should consider their unique needs, context and circumstances when choosing a CDO beyond the following four characteristics.



What makes a great CDO?

1 Is focused on business value

A business value-focused CDO effectively communicates how an organization's data strategy will achieve the business objectives and add value to all functional business units.

Why it's important

Most CDOs possess a strong foundation of technical expertise but lack the fundamental soft skills and business acumen needed to understand and demonstrate how data and analytics can benefit the business. The CDO must be able to convey how they provide value for ENR companies to be successful.

In practice

CDOs must collaborate with business leaders to conceptualize their target state, then use the future-back method to determine how data could be used to achieve it. This business-centric approach will directly link the KPIs of specific data initiatives to value drivers in the organization, allowing CDOs to define their progress in a way that's measurable in the context of the business. As a result, the data strategy and the CDO's objectives are more palatable to senior leaders since they are tied directly to the organization's strategic priorities, allowing the CDO to clearly communicate the value their work provides to the rest of the organization.

Defining features

- ▶ Has a blend of technical and business proficiency
- ▶ Has senior leadership experience
- ▶ Can communicate effectively in business terms
- ▶ Has a track record of being a collaborative "team player"

2 Balances enablement and control

A great CDO must strike a balance between using and controlling data. In their 2021 Big Data and AI Executive Survey, NewVantage Partners defined this CDO dilemma as being defensively or offensively oriented. Defensively minded CDOs focus predominantly on creating strict data governance policies that maintain regulatory compliance. Offensively minded CDOs see data as a business asset that should be used to empower business benefits.

Why it's important

Weak data controls can lead to security concerns, while excessive data controls limit the ability for information to be shared, analyzed and exploited to build sustainable competitive advantages.

Organizations across all sectors are scrambling to use their data more effectively to differentiate themselves from their competition, and in 2021 the mindset shifted heavily. CDOs are now spending approximately 70% of their time on offensive activities, while the remaining 30% is dedicated to managing defensive compliance-centered tasks.²⁸

Transitioning the role of the CDO to concentrate heavily on using data offensively is becoming crucial to keeping ENR organizations competitive as they face volatile commodity prices, high infrastructure renewal costs and ESG standards.

In practice

Given the current pace of global technological change and innovation, offensively minded CDOs are the best equipped to transform organizations and make them more competitive. But ignoring data governance principles and privacy entirely is also not an option. CDOs must understand the importance of being able to freely disseminate data throughout the organization without compromising stakeholder privacy, security or trust.

Defining features

- ▶ Thinks of data as an asset
- ▶ Understands the importance of data security and regulatory compliance
- ▶ Can articulate how the two mindsets must be balanced

3 Views analytics and data as a value chain

Great CDOs view data and analytics as a decentralized value chain instead of a centralized, isolated silo.

Why it's important

Data is an enterprise-wide asset that is most effective when it can be extracted, analyzed and disseminated to each functional unit of the business. A decentralized data governance model is more flexible, offensive and business oriented because it empowers functional business units to make use of data and shares data accountability across the enterprise.

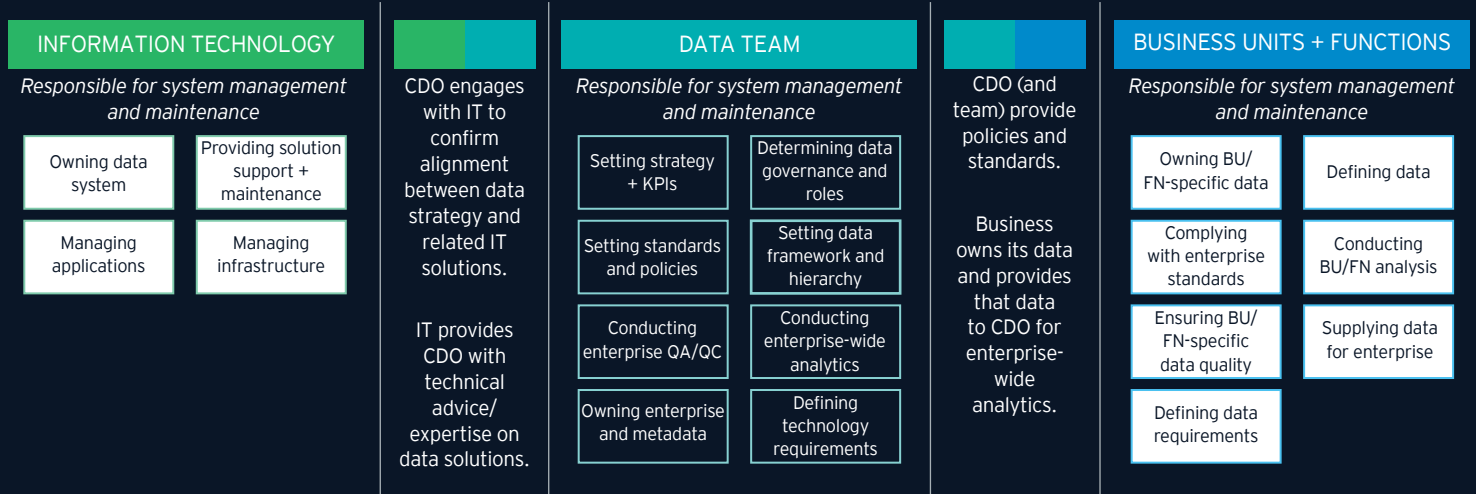
Allowing functional business units own their data keeps it in the hands of experts who can conduct analysis specific to their needs, instead of a centralized analytics team that may not understand the business objectives. While challenging, decentralized data models can contribute to breaking down some of the silos in ENR companies.

In practice

A decentralized data governance model positions the CDO and data team as the link between the greater IT department and functional business units.

The CDO and central data team:

- ▶ Govern data across the enterprise, setting the data strategy, policy and practices
- ▶ Provide data expertise and learnings to the business units to help them achieve strategic objectives
- ▶ Work with IT to ensure there is alignment between the data strategy and related IT solutions



Defining features

- ▶ Can communicate with both IT teams and business units
- ▶ Understands the value of enabling solid data management and analytical capabilities in functional business units
- ▶ Enables data literacy in functional business units to increase organizational agility

4 Aims to build a data-driven, collaborative culture

Great CDOs must be able to disseminate a data-driven mindset across to the entire organization, with buy-in from all levels.

Why it's important

To achieve the full benefits of data, there must be an organization-wide shift in mindset towards data-driven decision-making and problem-solving, starting from the top. The true value of data comes from using insights gained from data analytics as a platform for collaboration between various departments and levels of the organization. This skill is especially crucial in ENR industries, which have been comparatively slow in adopting new technologies and data capabilities.

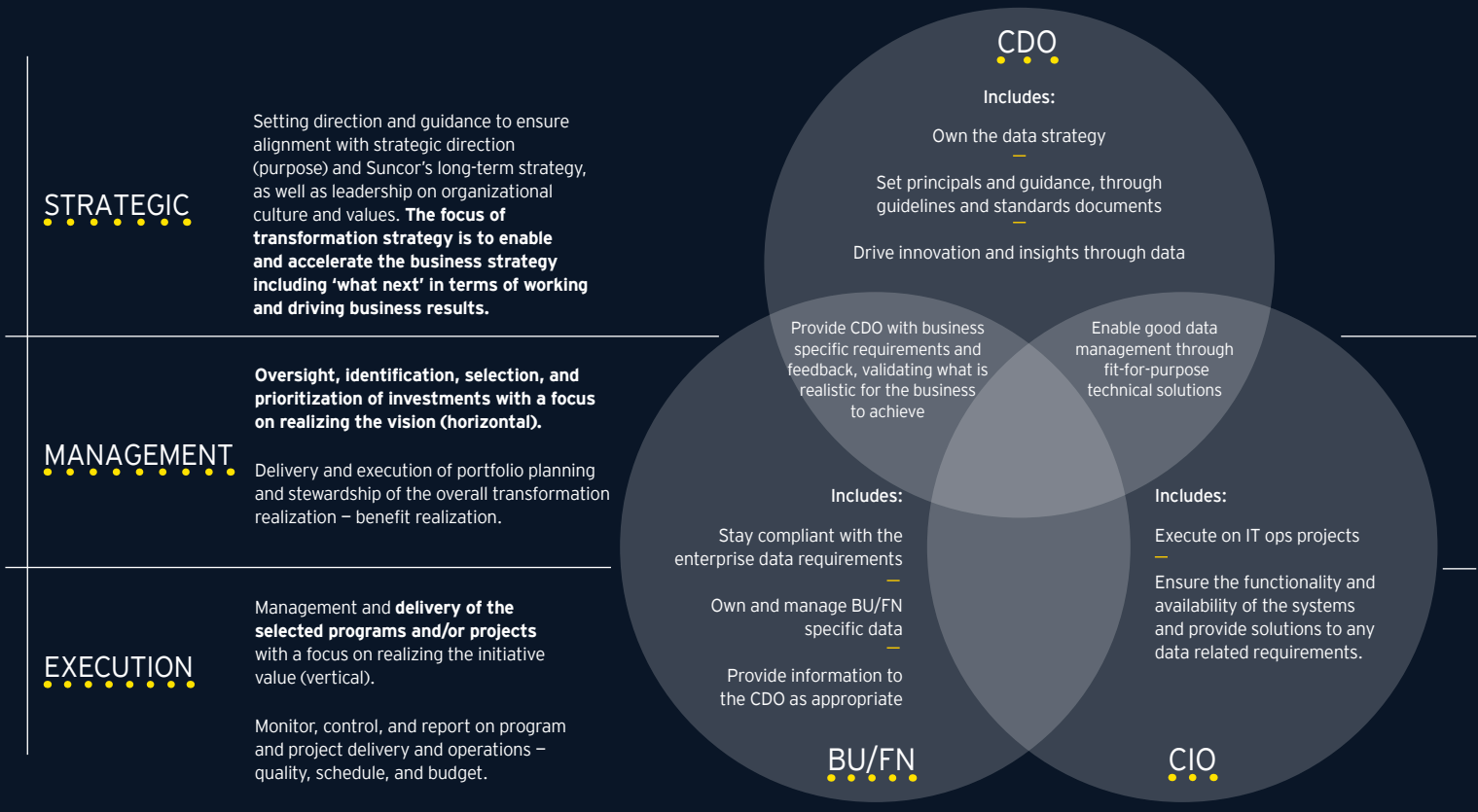
In practice

CDOs must implement data-driven changes to corporate culture by effectively collaborating with leaders across the enterprise and persuading them to accept, or even champion, necessary amendments despite some growing pains. To do so, CDOs must be able to successfully navigate the complex relationships present in each functional layer of the enterprise. These layers include:

- ▶ **Strategic:** The CDO should work with senior leaders to build the data strategy, set principles and guidelines related to data governance, and drive innovation using data. In this layer, the CDO focuses on enabling and accelerating the data strategy to drive business results.
- ▶ **Management:** The CDO must also work with functional business units to determine business-specific requirements for possible data initiatives and build fit-for-purpose technical solutions in collaboration with the CIO and IT department. Here, the CDO is focused on providing oversight and identifying which data investment opportunities will aid the organization in realizing its vision.
- ▶ **Execution:** The CDO should support business units as they analyze data and build function-specific insights. This helps all business units stay compliant with data governance standards and policies.

The relationships and overlaps between the CDO, CIO and business unit/function (BU/FN) leaders are the most critical to building a data-driven culture and the success of the data agenda.

The CDO, the CIO, and the business have intersecting responsibilities. Let's examine the responsibilities of the CDO, the CIO and the business, by the Functional Layers.



If any relationships in one of the functional layers deteriorates, change initiatives the CDO proposes could face significant resistance.

- Defining features**
- ▶ Can motivate and inspire colleagues
 - ▶ Displays strong relationship management skills
 - ▶ Has change management expertise



Critical success factors

The characteristics of a great CDO are key to identifying excellent candidates. But what about after they walk through the doors of an ENR organization? Selecting the proper CDO is crucial, but ensuring they are successfully integrated after they are hired is equally important.

The following section outlines critical success factors that are broader in nature to help set up both the organization and the CDO for success in the early stages of their tenure.

For the organization

Set fair expectations and time to adjust

As we touched on previously, a major challenge CDOs face is defining the tangible value data can provide to an organization. Reasonable expectations of what a CDO can truly accomplish must be set at the start of their tenure, but most organizations are so desperate to build data-driven competencies that they lose sight of the time and effort required to implement these capabilities.

Research conducted by the Harvard Business Review indicates that most organizations end their “honeymoon” phase with their CDO and expect tangible results after 18 months on the job.²⁶ This expedited timeline restricts the CDO’s ability to build deep connections with functional business unit leads, which could lead to potential misalignments in the data strategy and strategic priorities of business units across the enterprise. This misalignment will make business leads resistant to change, which 92% of organizations believe is their most significant barrier to becoming data driven in 2021.²⁸



Allow the CDO to be dynamic and autonomous

CDOs must be given the autonomy to take on various roles across the enterprise to enable change effectively, ensuring they have the scope of influence required to create a robust data strategy and, more important, champion its adoption.

We've identified four unique roles CDOs must be able to fulfill to guide the data strategy and empower functional business units. These include:



Strategist: Partners with the business to align enterprise and data strategies to maximize the value of investments.



Enthusiast: Champions the use of data to increase business agility and manage complexity.



Operator: Defines, manages and governs data policies and programs to promote and control operational efficiency.



Catalyst: Oversees change initiatives, stakeholder engagement and talent management related to data projects.

The problem many organizations face is that they understand the role of a CDO as an “operator” but fail to recognize the pivotal role the CDO will play in fostering innovation, progressing change and achieving strategic objectives. This narrow line of thinking can lead to exceptional CDO candidates being significantly underused.

Grant the CDO executive status and reporting structures

Inadequate reporting structures can considerably reduce a CDO's effectiveness. Traditionally, the role of the CDO has been heavily associated with the organization's technical operations, reporting directly to the CIO. Conventional wisdom dictated this was the best possible reporting structure since data was viewed solely as an input into IT systems instead of a business asset.

A critical error in this way of thinking is that it pushes the data strategy further away from the needs and priorities of business units. This reporting structure runs the risk of having the CIO's technical visions relating to how information is transmitted take precedence over the CDO's strategic visions, which are focused on applying information to deliver business value. In other words, the data strategy could be altered to fit a technical solution that fails to meet the organization's strategic priorities.

Organizations should structure themselves so the CIO and CDO work as equal partners who report directly to the CEO. This allows the CDO to stay offensive and play a more significant role in value creation while ensuring the supporting data and technical solutions are aligned to the organization's strategic objectives. As the pace of technological change increases, the CIO-CDO relationship will be vital in developing the competitive advantages necessary for organizations to remain relevant.

For the CDO

Form partnerships

A recent study showed that CDOs who form alliances internally are almost three times more successful than ones who don't.³¹ CDOs should focus on building relationships with a few forward-thinking business partners in their organization to understand their goals and objectives, discuss what is possible and align their data strategy accordingly.

These partnerships can also help with the challenge CDOs face in translating data infrastructure improvements into tangible business outcomes. Partners can become change agents across the organizations and share their perspectives with CDOs to help them learn more about business considerations and how to connect data and business outcomes.

CDOs should also form partnerships externally (e.g., technology platform vendors, industry analysts, global system integrators) to gather insights into how to overcome the challenges they currently face.

Manage expectations

Understanding what a given organization expects and then developing realistic plans and timelines to meet those expectations can be the key to longer, more effective and happier CDO tenures.²⁶

CDOs should spend the first few months of their tenure meeting colleagues from different areas to understand the level of data literacy across the organization, the organizational culture, the availability of relevant skills or staff and so on. This will help a CDO understand whether the organization's expectations are realistic and achievable.

CDOs should also balance quick wins for the business with longer-term data and analytics mandates, setting realistic expectations for how quickly they can be achieved.



Develop key performance indicators

A core reason why CDOs struggle to communicate their value to senior leadership and throughout their respective organizations is because of overly complex and poorly defined KPIs. So how can CDOs establish effective KPIs that resonate with senior leaders and employees?

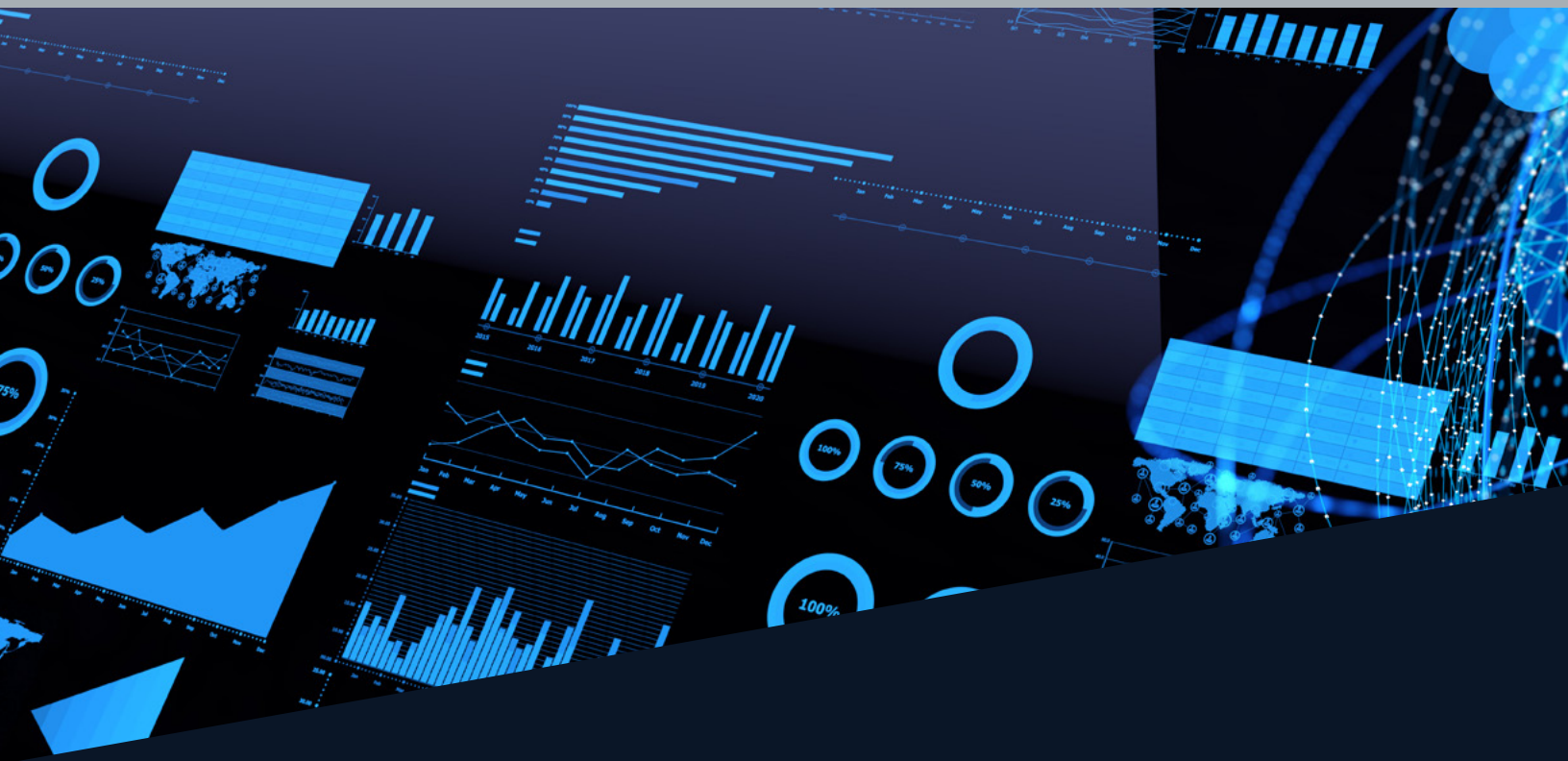
The APQC (American Productivity & Quality Center) knowledge base conducted a study in 2018 that outlined a robust process for selecting, socializing and communicating operational KPIs.³² This process helps organizations develop easy-to-digest, data-driven KPIs and ultimately establish a data-driven culture in an organization.

We've combined this study with internal research to create a comprehensive approach CDOs can use to construct effective and palatable KPIs.

1. **Focus on specific departments:** The needs of different functions vary significantly, so the KPIs used to track data-driven initiatives across departments need to reflect these differences. By establishing department-specific KPIs, CDOs will be able to communicate performance using language and metrics that resonate with department leads and align with their strategic objectives.
2. **Be collaborative and focus on high-impact metrics:** The simplest way to help stakeholders understand KPIs is to involve them in the design process. Hosting open discussions with employees at all levels will help the CDO grasp what insights are the most valuable to track. This should be an exhaustive process in the beginning but refined to represent the 20% of metrics that measure 80% of the value in a specific business unit.
3. **Keep things focused on the money:** As we've mentioned several times thus far, the CDO's data strategy needs to be focused on how data will generate specific and unique economic value for an organization. The CDO's KPIs should spell out how various data initiatives impact risks, costs and benefits and how they affect a business unit's net financial gain or mission realization.

By following the considerations outlined above, CDO's can highlight their progress in a way that is understandable and applies to various stakeholders.





Data governance 2.0

The perception of data and how it's managed continues to evolve as more and more organizations undergo digital transformations to become more mature in their use of data. To catch up to other industries, ENR organizations need to be aware of the new trends and methods for making use of data to drive value that are constantly emerging.

Data ownership (dictatorship) is dead

Data ownership has been historically centered around a single business owner tasked with controlling the access, use and quality of an organization's data. As the prevalence of data analytics increased across various business domains, weaknesses in the centralized approach to data ownership began to manifest as a lack of flexibility and versatility, which created systemic bottlenecks in critical data pipelines.

It didn't take data practitioners long to realize the centralized model was predicated on pigeon-holing business needs into technologies instead of enabling the business through technology. Therefore, it's safe to say the age of siloed and centralized data ownership is over and the need to scale is inevitable.

CDOs are breaking away from the past and are coming to the realization that data democratization is the necessary leap towards data-fueled innovation. Data democratization is the key to enabling the widespread dissemination of new ideas, creating innovative ways to deal with data and extracting relevant insights.



Data is your most valuable product

To effectively analyze data and deliver insights that empower an organization's strategic approach, all organizational data must be served in a well-defined and ready-to-use format for employees. The "data as a product" concept treats organizational data as a product and employees as consumers. Much like a standard business to consumer (B2C) relationship, the data as a product concept focuses on developing data products that satisfy various needs or facilitate specific business outputs for data consumers.

Moreover, to provide the best user experience for data consumers, CDOs must establish data governance mechanisms to ensure all organizational data products are³³:

<p>Discoverable: Simple to find in an enterprise inventory of other data products.</p>	<p>Addressable: Possesses a unique address that allows users to access it programmatically.</p>	<p>Understandable: Easy for any user to grasp without contacting the owner of the data product.</p>	<p>Trustworthy: Accurate and absent of any unexplainable or unjustifiable errors.</p>
<p>Interoperable: Easily linked and consolidated using a common set rules and standards.</p>	<p>Secure: Protected by dynamic access controls and encryptions to limit potential breaches.</p>	<p>Natively accessible: Easily accessible via native enterprise applications.</p>	<p>Self-contained and valuable: Can stand on its own and provide value independent of other data.</p>

Data governance as code

As organizations relinquish control back to individual business units through decentralized governance models, data management is becoming increasingly complex. Even the most modernized data governance models rely heavily on a combination of people, tools and scripts to keep the business running.³⁴

Organizations are achieving their ideal decentralized approach to data governance, but it's at the cost of having employees manage the complicated interactions between departments, risking an increase in human error as well as employee dissatisfaction. Therefore, a new system is needed to ensure the advantages of a decentralized governance model are retained while finding ways to automate interactions to relieve employees' workload when it comes to managing data applications and IT infrastructure.

The concept of governance as code focuses on building "smart" software that understands what services you're trying to deliver or actions you're trying to execute in an underlying application.³⁷ In short, it focuses on coding in leading practices throughout various IT platforms and applications to ensure the correct actions are consistently being executed.

By making use of machine learning, the way humans interact with IT systems and data can be replicated and fully automated in a way that reflects the organization's data governance rules and standards. Governance as code will allow CDOs to establish a clear mandate and governance framework for the organization, which will remain intact even when authority and control over organizational data is decentralized to various business units across the organization.



Holistic data governance (process)

Unlike traditional command-and-control mechanisms for data governance that direct and assign specific employees to govern data on top of their formal job responsibilities, holistic data governance makes data governance the entire organization's responsibility. Using this approach, everyone – from senior leaders to supporting employees – has a specific role to play in controlling and managing data across several different data governance accountabilities related to the data itself, processes supporting data transmission, data analytics training, KPIs and the relevant platforms or applications that use organizational data.

By segregating the various accountabilities associated with each component of data governance across the organization, the framework enables CDOs to establish a set of clear governance guidelines at every level of the organization while decentralizing decision-making authority to the most relevant stakeholder. This gives individuals with the expertise required to deal with specific data governance challenges the appropriate level of autonomy to handle them efficiently and effectively.

Holistic data governance

	<u>Data</u>	<u>Roles</u>	<u>Processes</u>	<u>Communications</u>	<u>Metrics</u>	<u>Tools</u>
<u>Executive</u>	Leadership dashboard KPIs	Leadership Steering Committee	Endorse Enforce Authorize	Support Sponsor Understand	Approve Act	Policy Directive Audit
<u>Strategic</u>	Enterprise performance	Preside DG Program DG Council	Direct Approve Prioritize Resolve	Status Evaluate Command	Acceptance Participation Performance	Charter Best practices Guidelines Roadmap
<u>Tactical</u>	Subject area X-Business unit	Domain stewards Data owners SMEs	Facilitate Mediate Promote	Standards Subject area Project	Subject Quality Metrics	Standards Requirements Workflows
<u>Operational</u>	Business unit Function	Operational Data stewards Users	Operate Manage Handle	Orientation Onboard Ongoing	Accountability Efficiency Effectiveness	Glossary Dictionary Catalog Repository
<u>Support</u>	Accountability Inventory Metadata	Prog. Mgmt Admin Work groups Partners	Formalize Adhere Enforce	Plan Develop Deliver	Collect Report	DG Tools Metadata tools KIK artifacts

Key takeaways

For ENR companies in Canada to remain competitive in the volatile global environment, and in the face of their unique trends and challenges, they will need to be prepared to undergo significant digital transformations to make good use of their data. To successfully undergo these transformations, effective CDOs will be crucial members of the C-suite in ENR companies moving forward.

See below for the key takeaways of this report that ENR companies should consider three important takeaways when hiring CDOs and undergoing digital transformations:

ENR companies must set the CDO up for success

A CDO can wear many different hats. Depending on the organization's needs, the role may differ. However, it's crucial that companies enable their CDOs by:

- ▶ Providing them with a clear definition of their role
- ▶ Granting them executive status and reporting structures
- ▶ Allowing them to be autonomous and dynamic
- ▶ Providing reasonable timelines and expectations

CDOs need to be business-value focused

While balancing data enablement and control, CDOs must ultimately view data as an asset. They need to understand how it can be effectively used to create value to the business and achieve strategic objectives while being able to communicate that value to their executive peers.

Data governance should be decentralized and embedded throughout the organization

Data is most effective when it is used by each functional unit of the business as an enterprise-wide asset. To effectively implement a decentralized data governance model, the CDO must be able to effectively disseminate a data-driven culture.



How EY teams can help?

▶ **Fit-for-purpose governance model:**

Define the CDO role in the specific context of your organization. Help Establish reporting, interaction, touchpoints and overarching dynamics across the organization. Establish objectives and key results to help target and measure what matters most and ensure these are linked and embedded in the right parts of the organization. Develop critical success factors so the CDO role optimizes and adds value to your organization.

- ▶ **Data, analytics and AI strategy:** We can help identify key data capabilities, develop high-level operating models, develop data and analytics management practices, identify key technical and functional skills required, and develop target architecture to help enable the data, analytics and AI strategy.

▶ **Modern business intelligence and data warehousing:**

We can bring your strategy to life by getting you on modern Cloud-based data warehousing and business intelligence. We can help create an enterprise-wide architecture with consolidated data from critical internal and external sources to enable quick, consistent and effective reporting, Cloud platform, self-serve business intelligence and advanced data visualization, and increase your data trust and quality.

- ▶ **Advanced analytics, machine learning, artificial intelligence and data science:** We can take your data analytics capabilities to the next level with our AI/ML offerings. We can help you apply predictive analytics and machine learning techniques to improve forecasting, solve tactical and strategic problems and drive future growth.



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