

How DataOps can accelerate your Journey to AI

The people, processes and
technology that will transform
your business outcomes



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DataOps and its role in AI

Artificial intelligence (AI) technology has the potential to unlock new value from data and reveal new avenues of innovation for businesses. In fact, Gartner forecasts AI-derived value will reach USD 3.9 trillion in 2022,¹ as enterprises apply AI to build more intelligent and automated workflows, predict and shape future outcomes, and empower employees to do higher-value work.

However, there's no AI without good information architecture (IA). AI needs data to be interconnected, accurate and fast; these requirements will expose any weaknesses in your information architecture. If your data is

low-quality, inaccessible, siloed or untrustworthy, you won't be able to realize the potential of AI and maximize the value of data-driven insight or operations. That's why IBM developed the AI Ladder (see *Figure 1*)—it presents a unique perspective on how organizations can prepare for, and implement, AI technology. Organizations must modernize their data platform; collect, organize and analyze their data; and finally infuse AI throughout their business. These capabilities should leverage a scalable platform such as IBM Cloud Pak® for Data that can run on any cloud.

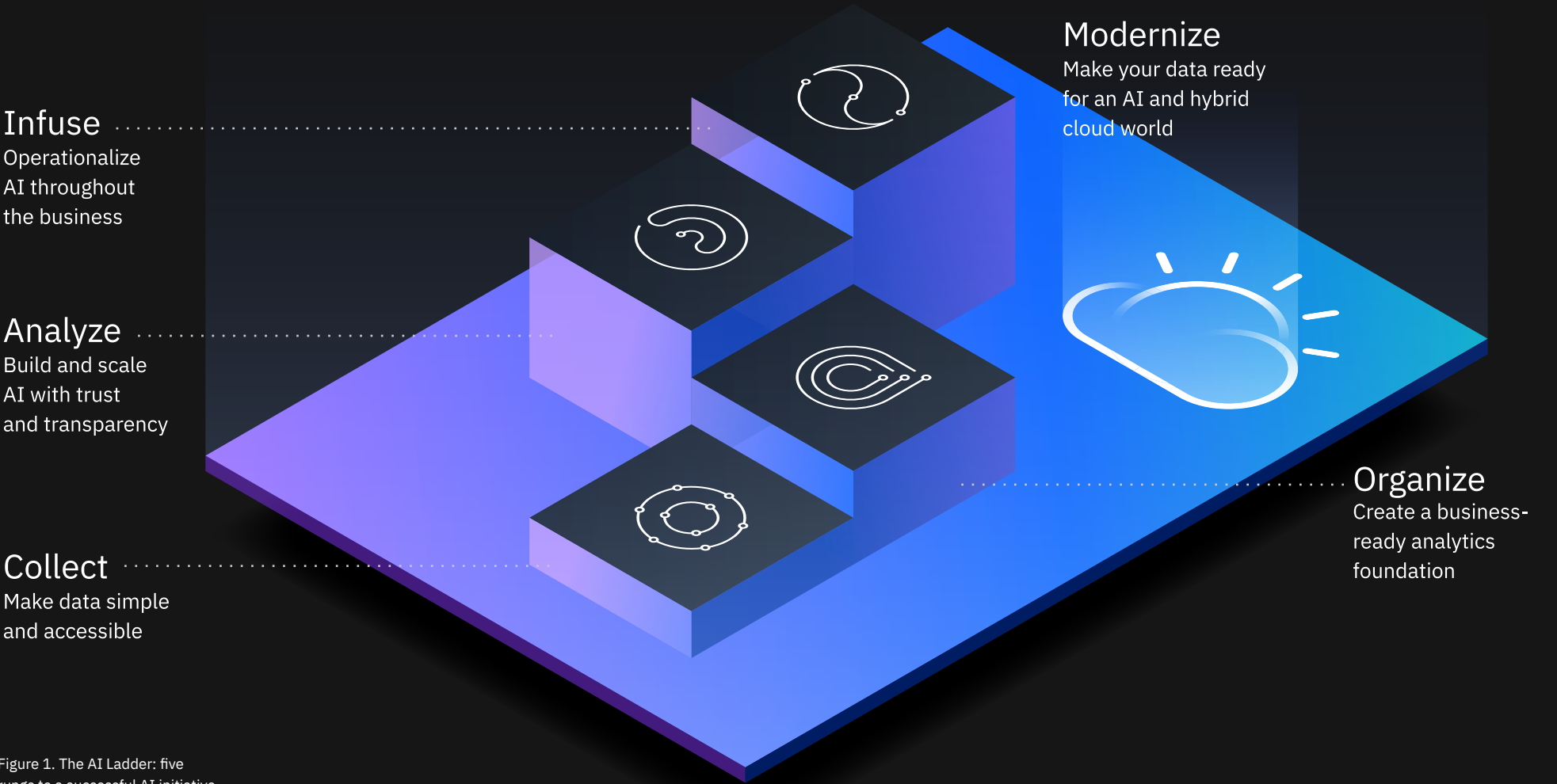


Figure 1. The AI Ladder: five rungs to a successful AI initiative

Build a business-ready analytics foundation

Given that data sits at the heart of AI, organizations will need to focus on the quality and governance of their data, ensuring it's accurate, consistent and trusted. However, many organizations struggle to streamline their operating model when it comes to developing data pipelines and flows.

Some of the most common data challenges include:

- Lack of data quality and governance
- Trustworthiness of structured and unstructured data
- Searchability and discovery of relevant data
- Siloed data across the organization
- Slower time-to-insight for issues that should be real-time
- Compliance, privacy and regulatory pressures
- Providing self-service access to data

To address these many data challenges organizations are transforming their approach to data: undergoing application modernization and refining their data value chains to stay compliant while still fueling new innovation.

Delivering trusted data throughout your organization requires the adoption of new methodologies and automation technologies to drive operational excellence in your data operations—known as DataOps.

DataOps corresponds to the “Organize” rung of the AI Ladder; it helps answer questions such as:

- What data do we have, and who owns it?
- Where is that data located?
- What systems are using that data and for what purposes?
- Does the data meet all regulatory and compliance requirements?

DataOps also introduces agile development processes into data analytics so that data citizens and business users can work together more efficiently and effectively, resulting in a collaborative data management practice. And by using the power of automation, DataOps helps solve the issues associated with inefficiencies in data management, such as accessing, onboarding, preparing, integrating and making data available.

IBM DataOps capabilities help deliver business-ready data to the right people at the right time from virtually any source, thanks to:

- AI-enabled automation and infused governance
- A market-leading enterprise knowledge catalog
- Increased efficiency, data quality and findability
- A unique six-phase DataOps methodology

What is DataOps?

DataOps is defined as the orchestration of people, processes and technology to deliver trusted, high-quality data to whomever needs it.

People: Empowering your data citizens

A modern enterprise consists of many different “data citizens”—from the Chief Data Officer; to data scientists, analysts, architects and engineers; all the way to the individual line of business users who need insights from their data. DataOps seeks to create and sustain a data-driven culture that enables collaboration across an organization to drive agility, speed and new data initiatives at scale.

To support this, DataOps leaders should define the roles all data citizens play in advancing the DataOps culture and practice. This includes designating “data stewards” responsible for

each subset of data, whether subject area, function, business process, system or project. The specific model for data stewardship can depend on the organization’s current status and future goals. Each organization has unique requirements where stakeholders in IT, data science and the business lines need to add value to drive a successful business. Also, because governance is one of the driving forces needed to support DataOps, organizations can leverage existing data governance committees and lessons from tenured data governance programs to help establish this culture and commitment.



The benefits of DataOps mean that businesses function more efficiently once they implement the right technology and develop self-service data capabilities that make high-quality, trusted data available to the right people and processes as quickly as possible. *Figure 2* shows how a DataOps workflow might look: architects, engineers and analysts collaborate on infrastructure and raw data profiling; analysts, engineers and scientists collaborate on building analytics models (whether or not those models use AI); and architects work with business users to operationalize those models, govern the data and deliver insights to the points where they're needed.

Individuals within each role are designated as “data stewards” for a particular subset of data. The point of the DataOps methodology is that each of these different roles can rely on seeing data that is accurate, comprehensive, secure and governed.

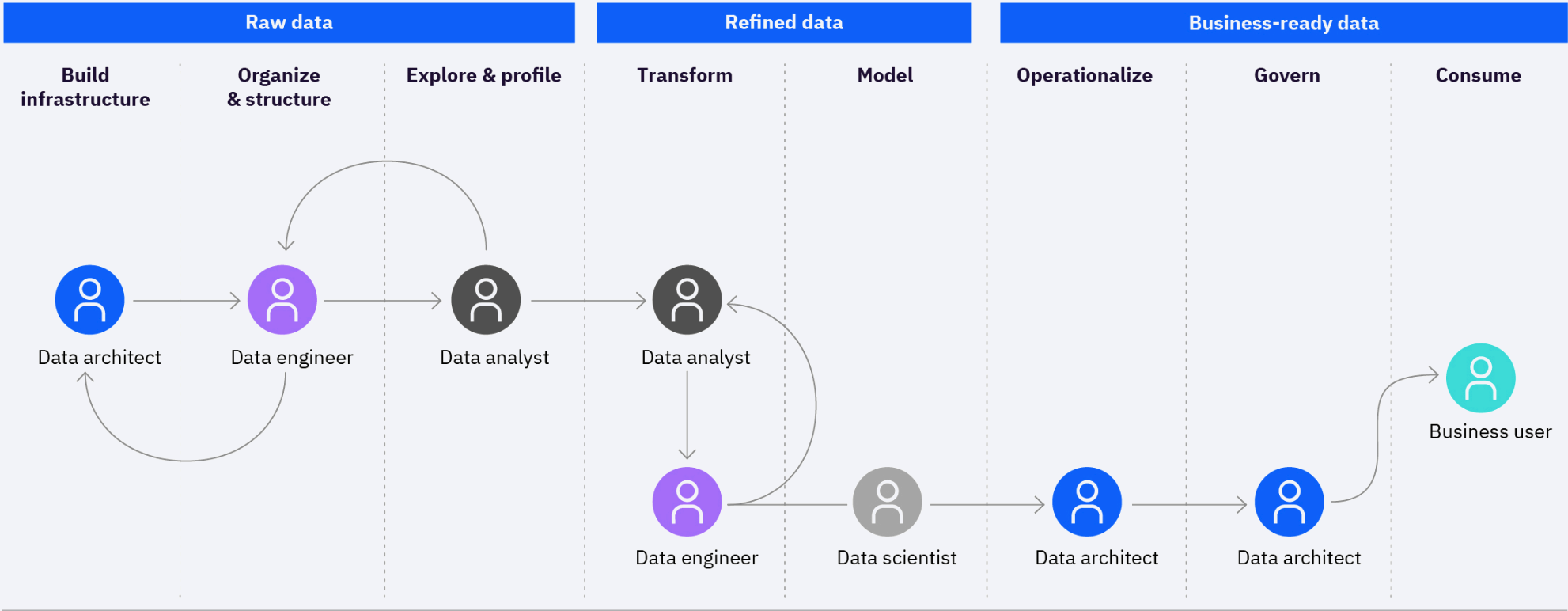


Figure 2. Example of a DataOps workflow by roles

Processes:

The methodology of DataOps

DataOps processes can address many failures that organizations have experienced in their digital transformation initiatives. That’s probably why 86% of companies plan to increase their investments in DataOps,² and Gartner named DataOps as an “on the rise” technology in its July 2019 Hype Cycle for Data Management.³ Given the critical role of a sound DataOps process, IBM has authored an implementation methodology to tackle key obstacles in deploying a DataOps practice and setting data strategy in alignment with business strategy.

IBM has identified six phases to implementing DataOps, all of which emphasize changing your data culture and help you implement the proper processes and technology.



Think

Ask what benefits you could gain from quicker access to trusted data. Take inventory of your data governance and data integration tools and practices. Continuously assess your DataOps maturity and align it to business goals.

Code

Use a robust, automated test suite alongside a version control system and source control management.

Deliver

Use data technologies such as machine learning, AI and infused governance to automate DataOps processes and workflows and implement features such as tracing and auditability.

Run

Use a deployment platform such as Red Hat® OpenShift® and a branched development environment to practice continuous integration and deployment.

Manage

Employ agile development techniques to work with consistent frequent, deployment.

Learn

Use appropriate communication tools and automated notifications to strengthen communication and process management.

Once a key business goal is determined, data must be scoped before initiating one or more projects to pursue that goal. DataOps processes can help with data scoping, because they address critical questions such as: Do you know your data? Do you trust your data? Are you able to quickly detect errors? Can you make changes incrementally without “breaking” your entire data pipeline?

Furthermore, a single DataOps view can encompass critical data assets that are typically stored—and potentially duplicated—in siloed applications from disparate sources. It also provides a consistent understanding of master data entities as well as their relationships and hierarchies.

Taken together, automated data processes that include AI data-led initiatives can help organizations:

- Deliver business-ready data that drives analytics and AI.
- Achieve operational efficiency and self-service access to data.
- Enable more secure data privacy and compliance.



Technology: Built for AI and automation

When your data systems are working in harmony, your organization is equipped both to seize future opportunities and to face current challenges that are hindering operations, growth or insights. Dedicated technologies are a crucial part of a successful DataOps strategy. The right DataOps technologies can enable organizations to overcome four common challenges that arise with enterprise data:

01

Low-quality data, which needs to be improved through governance, quality and curation measures including catalog and metadata management

03

Untrustworthy data, which needs to be resolved through master data management

02

Siloed data, which needs to be connected through virtualization, integration and replication

04

Complex data, which needs to be simplified through automated data preparation for self-service analytics and testing



01

Improving low-quality data through governance, quality and curation



When your organization is awash in data of different types, from multiple sources, it’s easy to lose track of what it means, what it can achieve and—more importantly than ever—what responsibilities and liabilities it creates. According to Gartner, data quality “is a success factor for accelerating business innovation with trusted data, while also mandating to fulfill regulatory requirements to reduce operational risk and increase efficiency”.⁴ Anyone who has struggled to catalog data manually knows the pain of low-quality data. Disparate views of data and time spent on manually cleansing data can drive down productivity and lead to:

- Failed AI initiatives due to low-quality training or operational data.
- Failed data lakes due to ungoverned migrations to Apache Hadoop or other data lake solutions, paired with increases in hand-coding.
- Increased pressures of compliance with regulations such as the GDPR, CCPA and the Basel Committee on Banking Supervision’s standard number 239 (BCBS 239).

To address these challenges, businesses are looking to machine learning capabilities to catalog, protect and govern all data types; trace data lineage; support automated term assignments and manage data repositories. With the right technology, all these capabilities can be part of a successful DataOps implementation.

Ideally, your DataOps technology will include a platform such as [IBM Cloud Pak for Data](#)—recognized as a leading enterprise insight platform in the [2019 Forrester Wave](#). Cloud Pak for Data enables adaptive deployment with hybrid and multicloud support, open metadata support, seamless integration with data science and AI tools, and enterprise scalability. And because it is a fully containerized service built on the industry-leading Red Hat OpenShift platform, Cloud Pak for Data can dramatically reduce your infrastructure needs. In addition, it includes services such as IBM [Watson® Knowledge Catalog](#) to improve the speed and accuracy of data cataloging and governance, ultimately helping you deploy AI and machine learning at scale. This kind of functionality is why Watson Knowledge Catalog won a [Customers’ Choice 2020](#) award from Gartner and was also named as a leader by [Forrester Wave](#).

By automating and integrating data governance, data quality and active policy management capabilities, your organization can be better able to protect and govern sensitive data, trace data lineage and manage data more effectively. The end result is operationalized, continuous, high-quality, trusted data throughout the organization.

Free trials
[IBM Cloud Pak for Data](#)
[Watson Knowledge Catalog](#)

02

Connecting siloed data through virtualization, integration and replication



Siloed data limits insights. By definition when your data is disconnected you will miss out on the additional nuance provided by different kinds of data—for example by combining historical transaction data with a shopper’s social media sentiment and real-time clickstream browsing behavior. Siloed data often arises naturally, because organizations are structured in discrete business units, operate on different platforms, and work in multiple locations. Multicloud architectures can also introduce more siloes and present other integration challenges with regard to data volume, governance, lack of a common control workflow and the need for unified security and management. At the same time, organizations have to cope with rapidly increasing data volumes while IT budgets remain flat or are cut. The bottom line is that unless siloes are connected intelligently, they limit insights and waste valuable time and resources.

However, with embedded machine learning, proper data virtualization, integration and replication, you can start to address these concerns. Virtualization is fundamental to the IBM DataOps approach, especially in the Cloud Pak for Data platform and the entire [IBM® Db2®](#) family of data management products. Virtualization combines data federation plus an abstraction layer—it permits users and applications to interact with multiple data sources at once from a single access point, regardless of the type, format, size or location of the underlying data. Virtualization is one powerful approach to integrating siloed data, but an integration solution like [IBM InfoSphere® DataStage®](#) expands the possibilities: running validation rules automatically as part of the ingestion process, supporting traditional data delivery styles (such as log-based replication and batch processing), supporting complex data delivery styles (such as real-time data synchronization and stream data integration within line data

quality), and automating metadata rules for policy-driven data access. Its rich functionality and variety of prebuilt functions and connectors offers organizations a faster time to value, reduces IT risk and helps ensure the right data is available in data lakes, data warehouses, data marts and point-of-impact solutions.

With your data connected, your business can:

- Access and trust both structured and unstructured data in near real-time across multiple clouds anywhere and anytime.
- Integrate diverse data delivery styles—including data replication, batch processing, and event-driven real-time capture using change data capture technology and stream data integration—to support insightful, real-time analytics.
- Deploy self-service capabilities that allow for improved sharing and collaboration across IT.
- Write applications once and run them against any of the data in your enterprise.

IBM DataOps data platforms offer excellent performance and scalability, including real-time updates. All these capabilities make DataOps ideal for multisite, multicloud workload distribution and continuous availability.

Additional resources

[DataStage guided demo](#)

[Learn more about IBM Db2](#)

03

Resolving untrustworthy data through master data management

Even if your data is managed correctly and accessible all at once, it’s not very helpful if you can’t trust its integrity. Untrustworthy data can arise even in well-governed data systems, and it requires a specific strategy to overcome. Many businesses are thoroughly inundated with data sets due to various capture applications, contact points, mergers and acquisitions, and more. This kind of data is disorganized, fragmented and redundant—making it a bottleneck as the businesses try to know their customers, products or ecosystem.

Master data management solutions help establish a singular, trusted, authoritative view of data assets and allow business analysts, marketing experts and information architects to have a complete view and unique identity of their data. With this view, they can optimize their customer service and relationship irrespective of the omni-channels customers use, serving the right data to the right business users at the right time.

The IBM master data management suite, including [Master Data Management on Cloud](#) and [InfoSphere Master Data Management](#), integrates machine learning with broader data governance and compliance initiatives between IBM DataOps, microservices and APIs. As a result, it helps organizations increase their topline through a deeper understanding of their customers, products and accounts, and impact their bottom line by reducing the costs and risks associated with managing this data.

Additional resources
[Explore Master Data Management products](#)
[Guided demo: InfoSphere Master Data Management](#)



04

Simplifying complex data through automated preparation

The final emphasis of DataOps technology has to do with simplifying and automating data preparation for self-service analytics and testing. In addition to managing their internal operations and maintaining compliance with all their data, modern organizations are under pressure to develop, refine, deploy and improve relevant applications and tools faster than ever before.

Therefore, these organizations are making large investments in modernizing applications to increase efficiency, reduce costs and gain competitive advantage. Many enterprises have moved from manually testing after development to an agile methodology in which testing and development happen at the same time. However, this raises process problems:

Organizations must decrease time to market by reducing testing time. To address this challenge, organizations are looking to automation and different test data management practices.

Development teams are relying on continuous delivery models to reduce errors and increase reliability and speed. To address this shift, organizations are looking for vendors and solutions that support agile workstreams.

IBM solutions, such as [InfoSphere Optim™ Test Data Management](#), help clients deploy higher-quality applications in less time—and at a lower cost—by provisioning and refreshing test data environments on premises or in the cloud.

With automation, a capable DataOps platform can help you transform large amounts of raw data into quality, consumable information, fast. When you empower your organizations with a self-service data pipeline to the right people at the right time from any source, you open the door to trusted, high-quality data to support reporting, analytics or testing needs. By incorporating data preparation functions into a DataOps practice, you can easily add automation to facilitate the final step in the data journey: use.

Additional resources

[Guided demo for InfoSphere Optim Test Data Management](#)
[Tutorial for InfoSphere Advanced Data Preparation](#)



DataOps users have achieved

95%

faster metadata

20 → 24

days

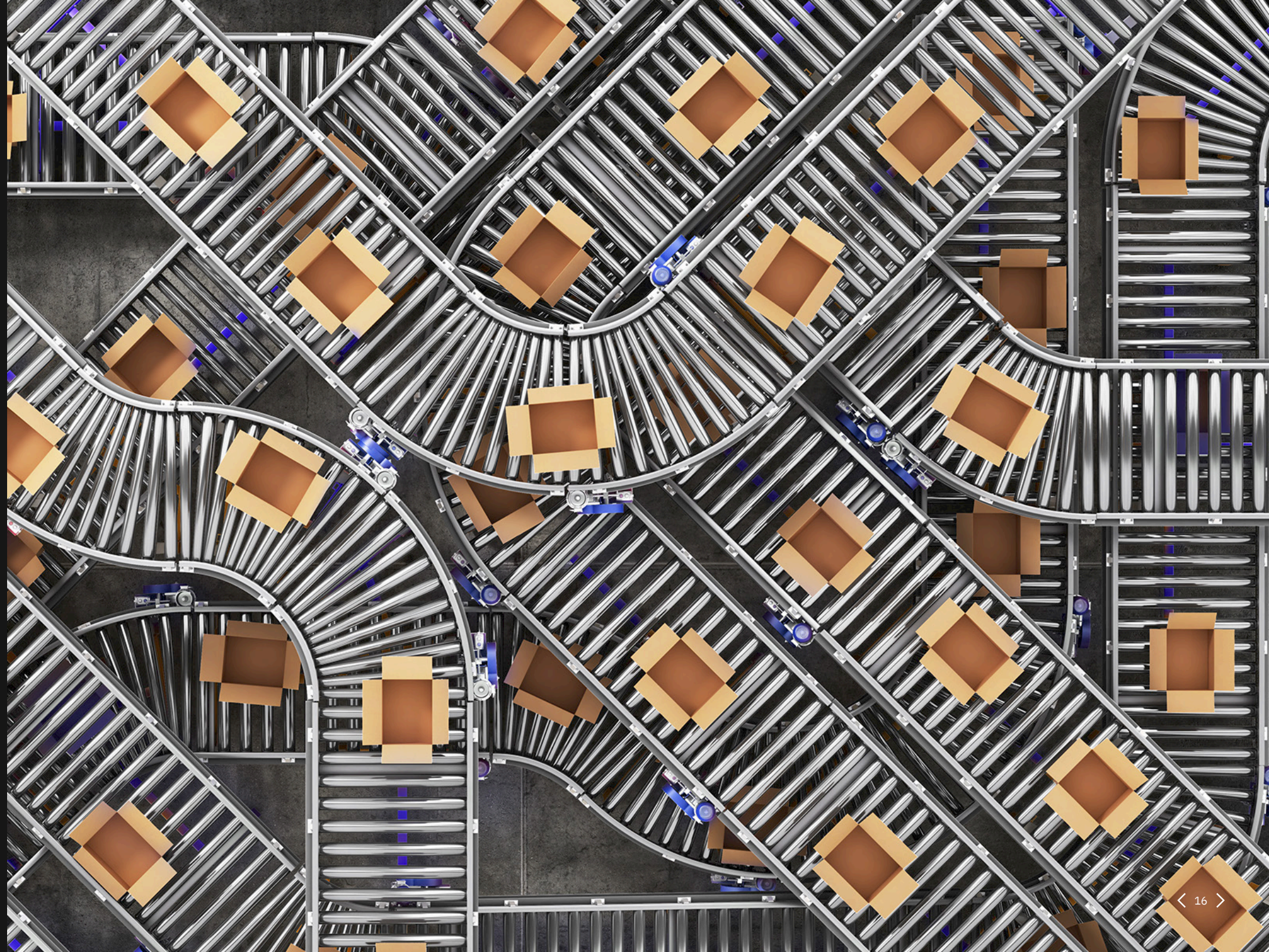
hours
of process time

21 million+

messages/hour

The value of DataOps in action

It's easy to talk about the value of DataOps in the hypothetical—to say that faster access to high-quality data would bring business benefits. But thanks to IBM's long history of working with leading organizations, we can also highlight examples from real-world implementations that show the transformative power of DataOps across industries.



Accelerate insights

For example, a **regional US retailer** recently decided to implement [Onera Decision Engine](#) in Google Cloud Platform (GCP) to help modernize supply chain management—including availability, fulfillment and online cart—among its 300 stores. Onera is a cognitive operating system that harnesses AI to predict real-world behavior, generating nuanced insights and decisions that power the modern commerce supply chain.

However, to feed this Onera engine, the retailer needed to deliver between 9 million and 21 million messages per hour—extracting data from on-premises Oracle systems, moving the data to GCP and finally publishing the data to the GCP pub/sub service with low latency and near-real-time performance. This

proved challenging; a previous attempt using the Talend platform was not able to exceed 1.2 million messages published to GCP per hour.

In response, the IBM DataOps team built a Python job in DataStage that was able to meet and exceed those targets, while also enabling much more scalability if needed. The DataOps team also demonstrated its ability for agile and rapid development of a prototype solution to solve the customer's problem. Their experience shows how an effective data platform using IBM DataOps methodology can support unprecedented throughput, feeding AI-driven analytical applications on any cloud for real-time insight.



Improve processes

Another example comes from **major European retailer** that was struggling to process and analyze exploding volumes of data generated daily by their 40,000 employees operating in 60 countries. They couldn't gain insight fast enough or frequently enough using their old analytics infrastructure. But by implementing a big data integration, quality and governance solution leveraging [IBM BigIntegrate](#), [IBM BigQuality](#) and [Watson Knowledge Catalog](#), they were able to deliver high-quality data to their analytics environment faster than ever.

The results were dramatic; as a company spokesperson said, “we can run data processing tasks that previously took up to 20 days in just 24 hours.” This helps them perform customer affinity analysis (projecting what existing customers are likely to buy) quickly, so they can entice customers to come back for more after a successful purchase.

These same data platform improvements help this retailer perform *impact analysis on source systems* (determining whether a change to a data source would impact downstream applications) in minutes instead of three weeks, and calculate daily inventory stock positions in 4 hours instead of a full day, helping them keep the right products in stock at each store.

The company noted, “We were the first company worldwide to choose this combination of IBM tools for Hadoop. The IBM team worked closely with our business intelligence team to build a viable business case and deliver top-notch training, which gave us great confidence and peace of mind.”

Ultimately, this DataOps implementation means that the company has the insights needed to keep the right products on its shelves at all its stores and offer them at the right prices to keep customers happy and loyal to the brand.



Reduce costs and liabilities

The motivation was different at a **Fortune 50 global bank** that wanted to realize significant cost savings by moving their ETL workloads from Teradata and AIX® to Hadoop. Thanks to the integrated foundation provided by the IBM DataOps methodology, they were able to migrate over 18,000 jobs without needing to rewrite a single one. Over 99% of the migrated jobs ran perfectly the first time they were tested, and their largest jobs run 5x faster on the new infrastructure. This translates to millions of dollars of savings in storage and compute costs. The whole experience prompted one of the bank's officials to remark, "BigIntegrate is a terrific product!".

Another advantage arises when DataOps methodology and tools give a better understanding of existing data, helping

identify and remediate unforeseen liabilities. Consider the case of a **major US healthcare organization** that used IBM Information Analyzer to scan data tables that had supposedly already been scrubbed of protected health information (PHI) and personally identifiable information (PII). This organization wanted to confirm they were in compliance with a legal request to remove all PHI/PII from these tables, but soon learned that 15 of the 21 tables (71%) had not been scrubbed correctly and still contained PII. The potential liability of this oversight was so high and the IBM solution provided such value that it delivered ROI within two hours of going into use.



Avoid interruptions and find efficiencies

IBM has even applied DataOps principles to internal data processes such as **global supply chain management**. The IBM supply chain, with hundreds of suppliers in dozens of countries, can be affected by thousands of variables that have the potential to disrupt operations. IBM developed sophisticated analytics to predict these disruptions, track the location of components and even predict the business impact of rapidly changing events. However, those insights were only possible due to timely, trusted data from a huge variety of sources being fed in via an AI-infused DataOps platform.

These success stories demonstrate how thorough application of the DataOps methodology can lead to significant real-world business advantages, including the effective use of AI. However, even selective application

of DataOps processes and technology can have a big impact. For example, a US telecoms operator, a **financial services provider** and an **insurance provider** each used DataOps tools to automate data preparation, reducing the time to create a metadata glossary by 95%, and reducing time to discover metadata and assign terms by 90%.

Or consider a **global retailer** that drives savings thanks to an inventory forecasting system that uses DataStage input to track hundreds of thousands of SKUs and update use projections on a daily basis. In example after example, DataOps delivers value by delivering the right data to the right people (and processes) at the right time.



IBM DataOps Center of Excellence

How to get started with DataOps

The rationale for DataOps is simple: you can’t have confidence in your analytics or AI without trustworthy, complete and consistent data. When you consider how to get started, remember that IBM has long offered a combination of expertise, services and technology to businesses, and is the only DataOps provider that offers complete information management and governance for analytic insight and monetization of data.

With the IBM DataOps Center of Excellence (CoE) you can start building a robust DataOps strategy and benefit from a unique DataOps program designed with dedicated methodology, resources and technology. In this exclusive resource, experts work with clients to customize a DataOps approach based on their business goals and identify the right pilot projects to drive value for their executive team.

The DataOps CoE leverages the [IBM Garage™](#) methodology—an approach to enable business, development and operations to continuously design, deliver and validate new functionality. At a DataOps Discovery Workshop, you’ll use this Garage framework to assess your DataOps readiness and enterprise-wide needs. In a collaborative working session, the team takes a selected business objective related to developing, updating and managing data pipelines; identifies an area of focus; and develops concrete next steps.

Half-day Discovery Workshop agenda		● Joint activity	● Client led	● IBM led
8:30–8:45	● Introductions			
8:45–9:30	● Business objectives and desired outcomes <ul style="list-style-type: none">– Business view: short and long-term perspective, priorities– Technology view: short and long-term priorities– Key “must-have” requirements to achieve objectives			
9:30–10:15	● “As-is” <ul style="list-style-type: none">– Users, data sources, data flows, systems, dependencies– Opportunities and challenges (gaps) aligning to objectives– Organizations and team structure, stakeholders			
10:15–10:45	● Use case and focus			
10:45–11:30	● “To-be” <ul style="list-style-type: none">– Desired future capabilities and measures in context of business objective– Alignment of business goals– Data, capabilities, components			
11:30–12:00	● Action items / next steps			

Figure 3. Sample agenda for a half-day DataOps Discovery Workshop

Build an integrated technology stack on any cloud

Improve low-quality data

IBM is the only provider with a unified catalog fueled by advanced machine learning and smarter metadata for comprehensive data collection and discovery.

- Relevant products:**
- Watson Knowledge Catalog
 - IBM Cloud Pak for Data

Connect siloed data

With integration between different platform elements, you can build applications once and run native on Apache Hadoop, on Red Hat OpenShift, on IBM Cloud Pak for Data, on premises or in the cloud.

- Relevant products:**
- InfoSphere DataStage
 - InfoSphere Information Server
 - IBM Db2

Resolve untrustworthy data

Leverage a highly accurate matching engine with near real-time search results and tailor those insights to your business with over 800 industry models.

- Relevant products:**
- InfoSphere Master Data Management on Cloud
 - InfoSphere Master Data Management

Simplify complex data

Scale data preparation tools to meet enterprise-wide analytic needs and deliver powerful masking and data generation tools for security-rich test data.

- Relevant products:**
- InfoSphere Optim Test Data Management
 - InfoSphere Advanced Data Preparation



Next steps

With solutions that help integrate, analyze and govern structured and unstructured data—in the cloud, on premises and in hybrid environments—businesses can leverage technology, programs, methodologies and best practices to help accelerate and enhance opportunities for the democratization and monetization of their data. That’s DataOps: delivering the right data to the right places at the right time.

Get started today with
The IBM DataOps
Center of Excellence



Schedule a free one-on-one
consultation with
an IBM DataOps expert



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