snowflake®

DATA TRENDS 2024
MANUFACTURING

How Industry Leaders Are Building for Success in the Snowflake Data Cloud

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DATA IS TRANSFORMATIONAL

In 2023, the hype surrounding generative AI was massive. But in 2024, the real work is underway, as enterprises start to move their proprietary data into large language models (LLMs) and create bespoke applications that drive their businesses in new directions, and data plays a critical role in the innovation.

At Snowflake, we see this trend clearly, including among some of the largest enterprises in the Global 2000. Gen AI has moved out of the experimentation phase and into production. Our recent report, **Snowflake Data Trends 2024,** reveals how organizations have been using this transformative technology and other data-driven workloads within the Data Cloud between January 2023 and January 2024. Here are the topline results across industries:

- **The number of active accounts adopting machine learning (ML) functionality within Snowflake increased 67% since the ML functions of Snowflake Cortex went into public preview in June 2023. That opened up more possibilities because data scientists and other experts are no longer a bottleneck.**
- **Organizations' usage of data governance measures is rising, and seems to be improving organizations' ability to use data: While usage of tagging data increased 70%-100%, the number of queries against protected objects is up 142%.**
- **The number of native apps created by Snowflake users increased by 311%, while adoption of these apps soared 96%.**
- **Usage of Python, a very popular language for AI development, grew 571% — considerably more than any other language year over year.**

In this report, we'll take a closer look at how Snowflake's manufacturing accounts are using generative AI and other data-driven technologies, and explore the factors influencing AI adoption in manufacturing.

Our analysis reveals how manufacturers are interacting with the tools and features within the Snowflake Data Cloud. Understanding these trends and what they signify can provide valuable insights and clues to inform industry leaders' business strategies, planning and technology investments over the coming year.

METHODOLOGY

We looked at how our Snowflake accounts, including manufacturing accounts, adopted features and capabilities of the Data Cloud over the previous fiscal year to reveal trends, both in terms of the foundational development of data infrastructure and those users' first moves into advanced AI. Where relevant, we have compared industry usage to our broader, cross-industry metrics to show alignment and, more importantly, deviations. Generally, we compared usage in January 2023 to January 2024 to align with Snowflake's fiscal year, except in cases where features came into public preview during the year. In those cases, we compared the first full month in public preview to January 2024. For the full methodology, **see the appendix.**

INDUSTRY FACTORS DRIVING AI ADOPTION

In 2024, we will continue to see data and AI play critical roles in key business areas such as optimizing supply chain processes, powering smart manufacturing and driving environmental, social and governance (ESG) initiatives. In each of these scenarios, establishing a strong data foundation is critical for success.

Here are key influences leading to greater AI adoption across the industry:

- **Ongoing labor shortages and the talent gap:** During the pandemic, the U.S. manufacturing industry **lost 1.4 million jobs,** and it still hasn't caught up. According to the U.S. Bureau of Labor Statistics, **roughly 600,000 jobs remain unfilled** as of August 2023. Organizations are responding by focusing more resources on retention and retraining, and by turning to AI to bridge the talent gap.
- **Regulatory requirements and the demand for more data visibility:** As companies continue to drive electrification and ESG initiatives, they will need to achieve greater visibility across the entire supply chain. According to the **World Economic Forum,** only 5% of supply chain emissions stem from direct manufacturing (Scope 1 emissions) or are purchased directly from energy suppliers (Scope 2). Scope 3 emissions (derived from supply chain operations) can account for as much as 5 to 10 times that amount. Manufacturers will need greater visibility into emissions data provided by suppliers and will turn to predictive analytics to improve their ability to accurately gauge Scope 3 emissions.
- **The need for greater supply chain optimization:** As the pandemic demonstrated, weaknesses in the supply chain can have a ripple effect throughout the entire global economy. We foresee huge investments in AI and cognitive computing to optimize supply chain operations in the areas of demand forecasting, inventory management and quality control, among others.

INDUSTRY 4.0: THE NEXT INDUSTRIAL REVOLUTION WILL BE DIGITAL — AND AI WILL ACCELERATE IT

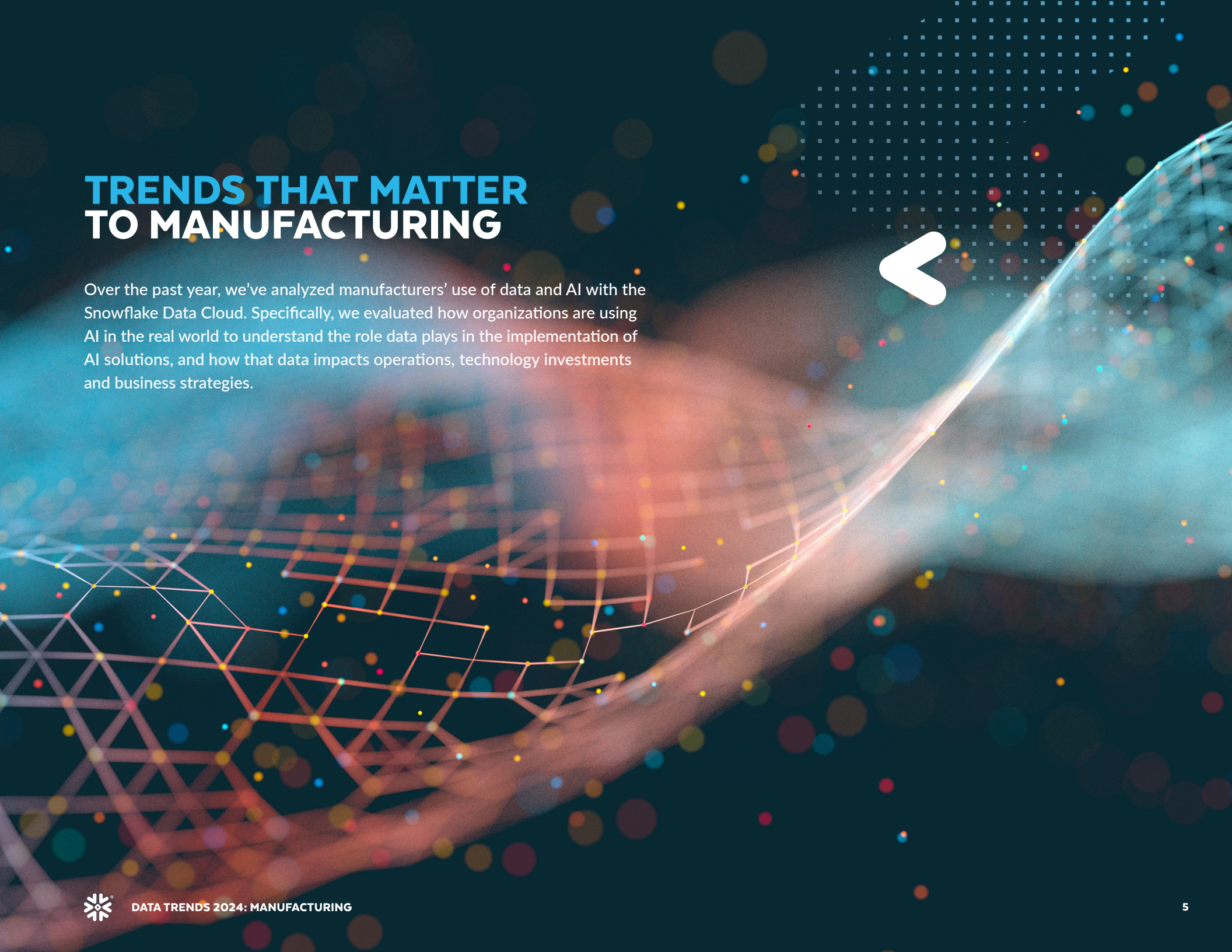
Since the invention of the steam engine, technology has been driving changes in the production of goods. Now digital technology is enabling a new industrial revolution, with data as the fuel. Industry 4.0 combines information technology (IT) with operational technology (OT) and the Industrial Internet of Things (IIoT) to transform manufacturing operations and create "smart" factories.

Key requirements of Industry 4.0 include:

1. **Robust cloud data platforms:** IIoT devices produce enormous amounts of data. Using a cloud data platform allows manufacturing facilities to consolidate IIoT data with information from ERP systems, supply chain, business operations and more. Maintaining all this information in a secure, centralized location allows for data analysis at scale.
2. **AI and machine learning:** The ability to analyze massive volumes of proprietary data and produce insights will help drive strategic decision-making, enable more accurate demand forecasting, lead to more efficient manufacturing processes, and allow business leaders to anticipate and mitigate future supply chain disruptions.

TRENDS THAT MATTER TO MANUFACTURING

Over the past year, we've analyzed manufacturers' use of data and AI with the Snowflake Data Cloud. Specifically, we evaluated how organizations are using AI in the real world to understand the role data plays in the implementation of AI solutions, and how that data impacts operations, technology investments and business strategies.



TREND ONE:

UNSTRUCTURED DATA USE IS RISING

Unstructured data constitutes an **estimated 80% to 90%** of all enterprise data, and the volume continues to grow steadily year over year. For manufacturers, unstructured data can include machine logs and maintenance records, user manuals, data from sensors operating on the factory floor, emails, audio and video files, and much more.

Across all industries within the Snowflake Data Cloud, the processing of unstructured data increased by 123% over the last year. During the same one-year period, the volume of this kind of data used by manufacturers increased by 78%. Some of this growth is due to the adoption of generative AI tools that can ingest unstructured data, analyze it, and generate answers to queries without the need to extract or transform the data.

From our study, it's clear that many manufacturers have begun to streamline their data architecture to meld structured and unstructured data. This trend will continue in 2024, as enterprises look to accelerate digital transformation by taking unstructured data — wafer maps, quality inspection reports, images of products as they're being manufactured and so on — and combining it with structured data in the cloud at scale.

TREND TWO:

PYTHON USAGE IS SPIKING

The Python programming language is particularly well suited to build AI apps. So it should come as no surprise that, over the last 12 months, Python was the most commonly used scripting language in Snowpark, our coding library component of the Snowflake Data Cloud.

Across all industries, Python use grew 571% in the last fiscal year, easily outpacing Scala and Java (up 387% and 131%, respectively). But for manufacturing organizations, the use of Python grew 855% in a year.

The reasons for this dramatic growth are not difficult to surmise. As organizations begin to develop their own LLMs and develop applications based on these custom models, one would expect an increase in the use of the AI programming tools that make them possible.

The increased adoption of Python as a programming tool indicates that manufacturers are performing more advanced processing of data using Snowpark — jobs that would have been processed in the past using Spark. This is yet another clear indication that developers are bringing more AI and ML work to Snowflake, because they need both a unified data platform and access to huge amounts of data to design, train and deploy advanced models.

PYTHON USAGE IN MANUFACTURING INCREASED

855%

TREND THREE:

DATA GOVERNANCE IS GETTING MORE REFINED

Efforts at data governance are rising across the board. In the Snowflake Data Cloud, this is evident in the increased use of tagging (for example, to identify sensitive policy-protected data) and masking (to restrict access to policy-protected data). In general, use of data governance measures rose 70%-100% in the last year.

Still, these added governance measures are not preventing organizations from unlocking the value contained in this data. Overall, the number of queries for access to policy-protected data assets rose 142% across all industries year over year, indicating that organizations are making deliberate, approved and proper use of their data. Like other industries in the Data Cloud, manufacturers increased their use of governance capabilities. Over the same period for manufacturing, the increase was even greater, coming in at 160%.

Data plays a crucial role in driving innovations like generative AI, and manufacturers are increasingly relying on data-driven strategies to transform their businesses. To succeed in this landscape, manufacturers must establish robust data governance to protect intellectual property, adhere to evolving regulations, and centralize data to build trust and confidence in data quality across the enterprise.

THE STATE OF THE MANUFACTURING DATA CLOUD

The ability for manufacturers to collect and analyze data will be one of the primary factors determining their success today. Data is the key to enhancing operational efficiency, streamlining processes, minimizing risk, improving product quality and cutting costs.

But simply collecting data is not enough. To glean the full benefits of AI and predictive analytics, manufacturers will need to first break down internal data silos and adopt a unified platform that allows them to share data across their organizations and with external partners in a secure and compliant way.

A unified, cloud-based data platform can help manufacturers address many of the most difficult challenges they currently face:

- **Gain visibility across the entire supply chain:** Achieving a comprehensive view into supply chain operations requires the ability to integrate data from a wide range of sources, including suppliers, production systems, ERP systems, inventory and warehouse management systems, logistics providers, and demand forecasters. Having full visibility into the supply chain allows manufacturers to more accurately predict consumer demand, manage inventory more efficiently, and make better business decisions.
- **Achieve a unified view of enterprise and manufacturing data:** By integrating data from IT, OT and IoT sources, enterprises can achieve high-performing smart manufacturing, reducing costs, increasing productivity and boosting margins. A unified view allows manufacturers to establish automated processes to minimize human error and spot product defects faster, which in turn can reduce production cycles while increasing yield. Combining enterprise and manufacturing data in one place is essential for creating more precise predictive maintenance schedules, speeding root cause analysis and uncovering innovative ways to improve manufacturing processes.
- **Manage cost and minimize supplier disruptions:** Integrating critical supply chain data from internal and external data sources — such as weather data, market indicators and supplier performance — helps manufacturers get ahead of potential supply chain disruptions and more effectively manage supplier risk. By creating digital twins of their supply chains, manufacturers can run what-if simulations to anticipate disruptions and develop contingency plans.
- **Drive value from connected products:** Manufacturers can address key challenges of connected products thanks to Snowflake's scalability, governance and ease of use. By taking advantage of analytics capabilities and seamless data integration, they can optimize product performance, enhance user experiences and drive innovation in their connected product ecosystems. Post-sale, manufacturers can optimize product performance incorporating IIoT data, increasing visibility into product performance and using the insights to drive upstream manufacturing improvements in product quality.

Increased need for scalability and flexibility

The need for a unified, secure, cloud-based platform that can handle vast amounts of data continually increases as developers put more AI applications into production and bring more AI/ML work into Snowflake. Fortunately, Snowflake was built to address this need. It allows companies to scale multiple workloads across their entire data stack using a single copy of their data — enabling a single source of truth without requiring them to extract, transfer and load information from an existing data warehouse or data lake. And **Snowflake Marketplace** provides access to over 600 providers offering 2,416 live, ready-to-use data sets, services and Snowflake Native Apps (as of January 31, 2024).

Meanwhile, regulatory demands and business resilience needs require manufacturing companies to store their data across multiple clouds. Since Snowflake works seamlessly across multiple providers, organizations can easily use separate clouds to collaborate for different purposes. A multi-cloud approach also protects organizations from detrimental business risks, and helps build business resiliency and better disaster recovery. And because manufacturing companies can share data entirely within Snowflake, they can exchange data more quickly and cost-effectively.

Since security and governance are major concerns for manufacturing companies, strict controls are required in these areas. Snowflake eliminates the need for data replication when sharing data by allowing data sharing entirely within the platform, so it's more secure than legacy data-sharing methods such as FTP, SFTP or email.

5 WAYS MANUFACTURING ORGANIZATIONS CAN LEVERAGE GENERATIVE AI

AI-driven chatbots will revolutionize how employees in factories and warehouses interact with technology. Conversational LLMs will allow workers to use natural language queries to get answers to key questions about supply chain, manufacturing and other operating processes much faster and more accurately.

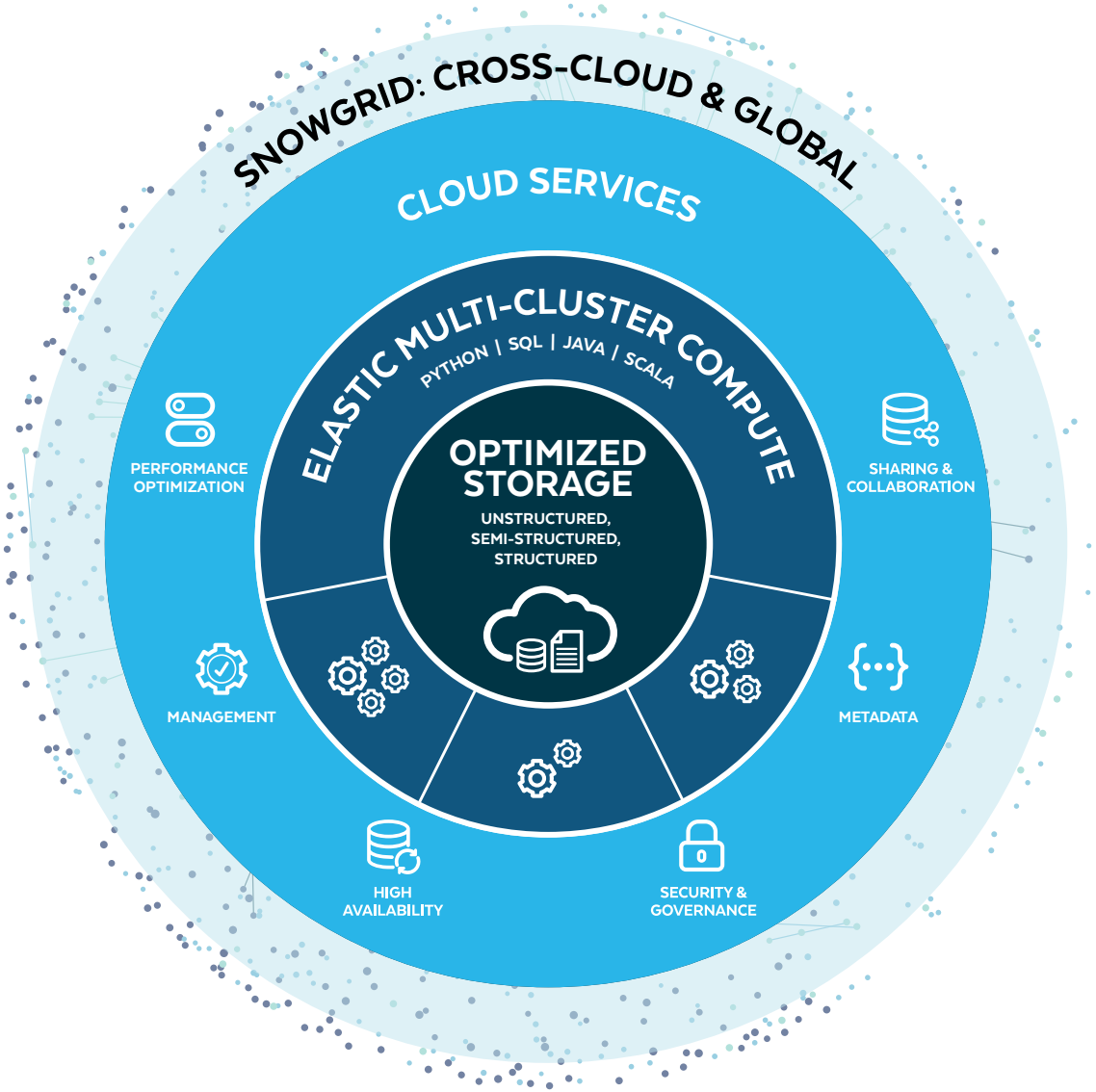
Here are five use cases for LLMs:

1. **"Why is this machine acting erratically?"** Factory workers will be able to use chatbots to diagnose and troubleshoot problems on the production line, reducing spoilage and downtime.
2. **"How do I do ___?"** Gen AI tools can provide on-the-job learning, or recommend more efficient ways to perform common tasks.
3. **"Where is that pallet of spare parts I ordered?"** Tracking the location of goods can help identify potential supply chain disruptions, enabling enterprises to improve relationships with suppliers and customers.
4. **"Is there a way to improve this process?"** LLMs can analyze quality inspection reports and maintenance documents, then suggest ways to optimize manufacturing and quality control processes.
5. **"How can we reduce our energy consumption?"** ML algorithms can help companies achieve their sustainability goals by analyzing energy use and emissions to suggest more efficient methods of operation.

The building blocks of a competitive advantage

In today's rapidly evolving business landscape, the Snowflake Manufacturing Data Cloud offers other important advantages over competing solutions:

- **Scalability:** The unified, easy-to-use Snowflake platform equips manufacturing companies to build a connected data ecosystem encompassing leading data and app providers, top solution partners and critical service providers. This enables them to power many varying workloads at scale.
- **Customizability:** Manufacturers can quickly customize generative AI and LLM solutions, and easily and securely use gen AI and LLMs, including third-party commercial LLMs. These solutions can also be kept in-house, further enhancing organizations' ability to securely govern policy-protected data and safeguard their intellectual property.
- **Accessibility:** Snowflake makes insights derived from data accessible to all authorized users within the organization, democratizing data-driven decision-making beyond just data scientists and other AI experts. People in any part of the business can write code thanks to gen AI integration, and answers to their critical questions may be just a click or query away.



Snowflake Platform Architecture

HOW MANUFACTURERS ARE USING DATA SHARING AND COLLABORATION TO SOLVE CRITICAL BUSINESS CHALLENGES

The Snowflake Data Cloud modernizes the way organizations access and use data via secure data sharing and collaboration. And with **Snowflake Marketplace,** manufacturing companies can access live, ready-to-use data, services and **Snowflake Native Apps.** Here are four important ways manufacturers are using data sharing and collaboration to gain a competitive edge and solve critical business problems.

SAP data analytics

With changes in SAP's warehousing strategy, SAP manufacturing organizations must patch together multiple technologies for data warehousing. This fragmented environment leads to increased complexity, data silos, higher costs, and the need for specialized skills to manage and integrate different systems. For all these reasons, SAP manufacturing organizations are turning to Snowflake.

Here are some Snowflake Marketplace partners that manufacturers collaborate with to unlock SAP data analytics:

- **SNP:** SNP is an expert in data and transformation with a large footprint and specialized expertise in SAP. Its software helps organizations integrate the most valuable business data securely, in real time and in usable formats to Snowflake.
- **Maxa AI:** Maxa automates financial and ERP insights for business teams under pressure to assemble, analyze and deliver everyday insights, as well as provide strategic guidance to the business. Its Snowflake Native Apps deliver pre-crunched, readily available insights in a data model that anyone can understand and use with no special skills, no upfront costs and no commitment.
- **Elementum:** Elementum is the first SaaS platform for building data-driven workflows on Snowflake. It lets businesses replace manual and repetitive processes with workflows automatically initiated and progressed by data. Elementum also utilizes pre-built workflows to address common use cases or build an intuitive UI and no-code administration. Since Elementum is connected natively to Snowflake, no integrations are required, and the data never leaves the Data Cloud.

Supply chain optimization

Supply chain performance is critical to manufacturers because it directly impacts operational efficiency, cost and overall competitiveness.

Here are several partners that Snowflake users are leveraging to optimize their supply chain:

- **S&P Global:** S&P's complete view of global energy and commodities markets allows organizations to make decisions with conviction and create long-term, sustainable value. Vital to navigating energy transition, S&P Global Commodity Insights' coverage includes oil and gas, power, chemicals, metals, agriculture and shipping.
- **FourKites:** Leading supply chain visibility platform FourKites extends visibility from transportation into yards, warehouses, stores and beyond. Tracking over 3 million shipments daily across road, rail, ocean, air, parcel and last-mile, and reaching over 210 countries and territories, FourKites combines real-time data and powerful machine learning to help companies digitize their end-to-end supply chains.
- **DAT Freight and Analytics:** DAT operates North America's largest truckload freight marketplace. Transportation brokers, carriers, news organizations and industry analysts rely on DAT for market trends and data insights derived from 183 million freight matches and a database of $118 billion of market transactions.

Energy management

Through Snowflake Marketplace, manufacturers can use comprehensive market data solutions tailored for the energy industry. Having timely data about the rapidly changing power market helps them improve operational efficiency, reduce costs and optimize energy procurement strategies.

Here are a few Snowflake Marketplace providers manufacturers are using to understand the energy market better:

- **Enverus:** Enverus is a trusted, energy-dedicated SaaS platform, offering real-time access to analytics, insights and benchmark cost and revenue data sourced from its partnerships to 98% of U.S. energy producers and more than 35,000 suppliers. With intelligent connections, its platform drives more efficient production and distribution, capital allocation, renewable energy development, investment and sourcing, and its experienced industry experts support organizations through thought leadership, consulting and technology innovations.
- **Yes Energy:** Yes Energy is the industry leader in North American power market data and analytic tools. It has collected energy market data since each ISO's inception, and as a result has the most comprehensive and accurate database of energy market data available. Yes Energy offers insights and analytics to build correlations, portfolios and other market signals with its data.

Connected products

Connected product data unlocks massive new opportunities for manufacturers, from optimizing product performance and improving user experience to generating new lines of business.

Here are a few Snowflake Marketplace providers that enable manufacturers to harness the power of connected products:

- **Weather Source LLC:** Weather Source is a leading provider of weather and climate technologies for business intelligence. Since 2015, Weather Source has enabled companies to quantify the impact of weather on their business operations and reduce waste, increase return on investment, fine-tune logistics, optimize marketing, improve resource planning and more.
- **AccuWeather:** AccuWeather's industry-leading global historical weather data set provides daily and hourly metrics dating back more than 10 years. AccuWeather historical weather data is available globally for nearly 10,000 locations worldwide and is fully customizable, best to serve the requirements and needs of users.
- **CARTO:** CARTO is the world's leading Location Intelligence platform, enabling organizations to use spatial data and analysis for more efficient delivery routes, better behavioral marketing, strategic store placements and much more.

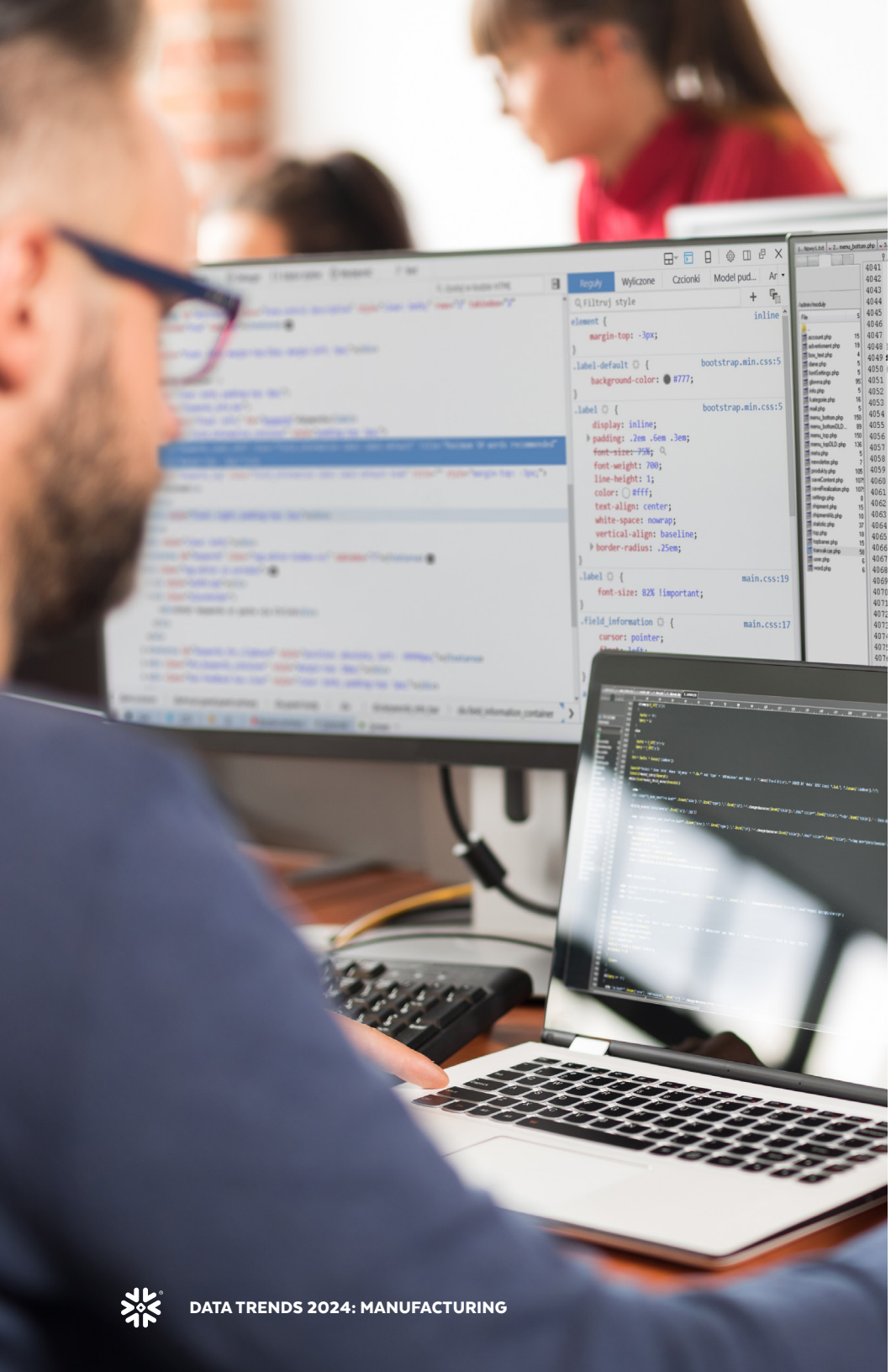
THE FUTURE OF MANUFACTURING IS DATA-DRIVEN

These are opportunity-rich times for manufacturers. Analytics and data-driven decision-making can enable legacy companies to streamline their operations and drive new revenue streams while also cutting costs. Generative AI has the potential to transform businesses that have yet to realize their full digital potential.

But to achieve the goals of efficiency, resilience and sustainability, enterprises need to break down existing silos and consolidate their data across the organization via a unified data platform. Having a single source of truth with solid governance policies in place not only is essential for taking advantage of gen AI, but also allows companies to comply more easily with increasing regulatory requirements around data.

A modern data cloud platform is critical to executing on an enterprise's robust data initiatives, as well as the success of its AI strategies going forward.

Learn more about how to build for success and prepare for the AI future with the Manufacturing Data Cloud.



APPENDIX: METHODOLOGY

The Snowflake Data Trends 2024: Manufacturing report is generated from fully aggregated, anonymized data detailing usage of the Snowflake Data Cloud and its integrated features and tools. In this report, we examine patterns and trends in data and AI adoption across Snowflake's Manufacturing accounts. These trends provide insight into the state of data and AI, including which technologies are the fastest-growing within the manufacturing space. Note that usage attributable to internal consumption, if any, has been removed and is not reflected in any of the metrics contained herein. The accounts and usage reflected in this report include both longtime Snowflake users and others who only recently joined the Data Cloud.

Except where noted in the text, the data in this report compares monthly averages from January 2024 (represented as "this year") to averages in January 2023 ("last year"). When compared, this is depicted as "year over year" growth to align with Snowflake's fiscal year end, though the figures themselves are only representative of January figures to calculate growth.

When possible, we have provided these year-over-year comparisons to showcase growth trends over time. Where data was drawn from Snowflake features that became publicly available after the start of the fiscal year, data was collected and compared as of the first full month after which the feature became available in public preview, and that date is noted in the text. Notably, growth figures for features moving into public preview are expected to be considerably higher, as private previews are limited in scope and necessarily restricted to select Snowflake customers.

ABOUT SNOWFLAKE

Snowflake enables every organization to mobilize their data with Snowflake's Data Cloud. Customers use the Data Cloud to unite siloed data, discover and securely share data, and execute diverse artificial intelligence (AI) / machine learning (ML) and analytic workloads. Wherever data or users live, Snowflake delivers a single data experience that spans multiple clouds and geographies. Thousands of customers across many industries, including 691 of the 2023 Forbes Global 2000 (G2K) as of January 31, 2024, use the Snowflake Data Cloud to power their businesses.

Learn more at snowflake.com