

5 steps to becoming a data-driven manufacturer

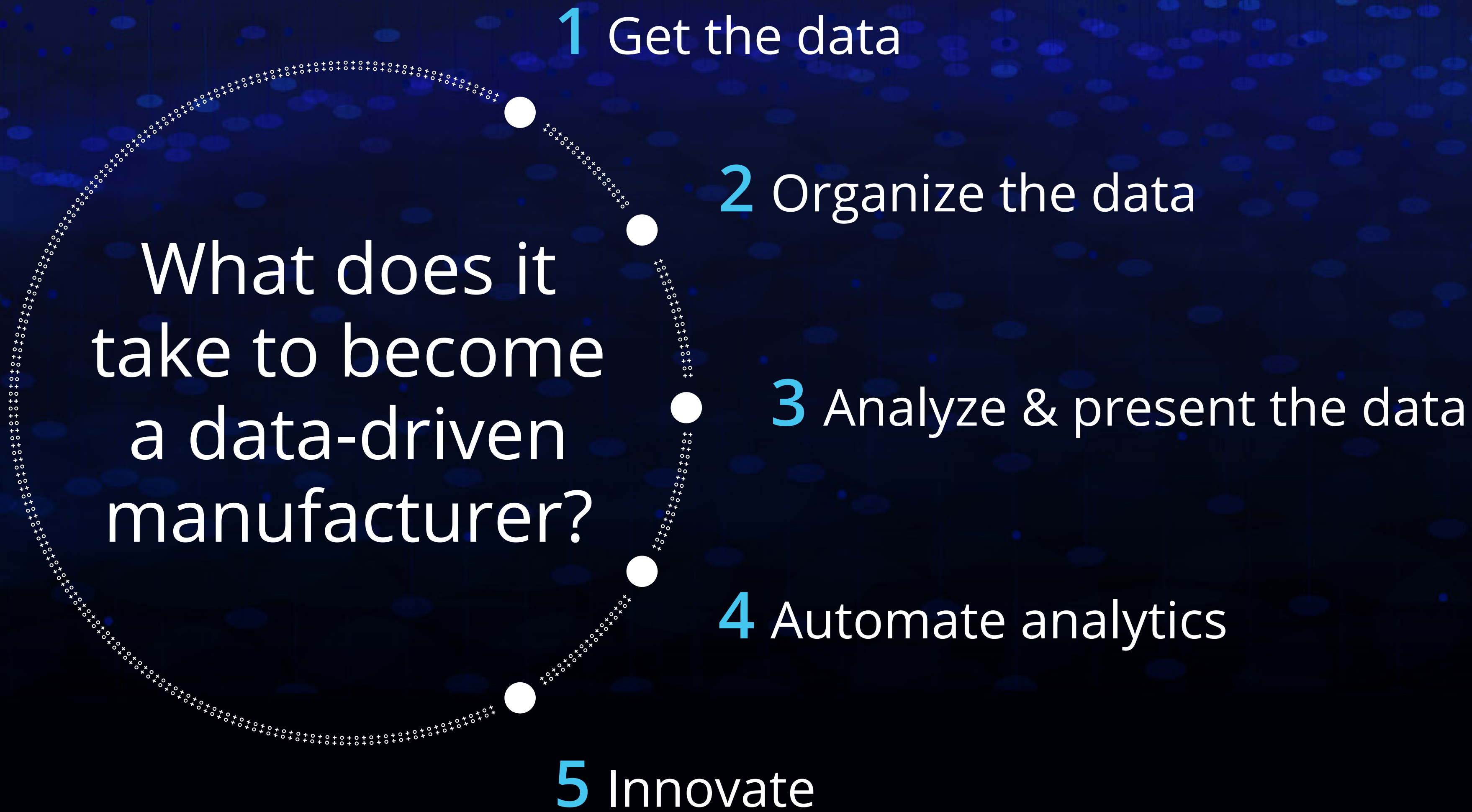
OPTIMAL+
Lifecycle analytics you can trust

Introduction

There is a lot of hype surrounding “Industry 4.0,” “Smart Manufacturing,” “the Industrial Internet of Things (IIoT),” and other associated terms, but it all boils down to one question: How do I become a data-driven manufacturer?

Companies strive to be data driven, realizing that decisions will be more objective and more likely to achieve the desired results. In fact, many companies understand that it can be extremely valuable to automate decision-making processes and let smart machines make decisions instantly.

Data-driven decision making impacts every aspect of a business. But in this article, I will focus on the manufacturing arena, where automated decision making involves tying analytics to machines and systems and letting the analytics drive actions on the manufacturing floor in real time—that’s smart manufacturing!



What does it
take to become
a data-driven
manufacturer?

The diagram features a central white circle containing the text 'What does it take to become a data-driven manufacturer?'. Surrounding this circle is a dotted white line with five larger white dots. To the right of each dot is a numbered step: 1 Get the data, 2 Organize the data, 3 Analyze & present the data, 4 Automate analytics, and 5 Innovate. The numbers 1, 2, 3, and 4 are in a light blue color, while the number 5 is in white. The background is a dark blue field of vertical lines and scattered dots in various shades of blue and purple, creating a data visualization effect.

1 Get the data

2 Organize the data

3 Analyze & present the data

4 Automate analytics

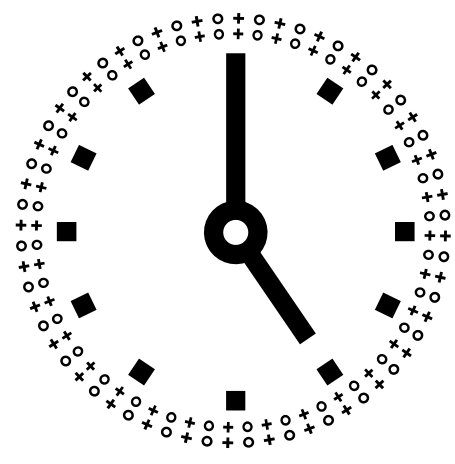
5 Innovate

1 Get the data you need



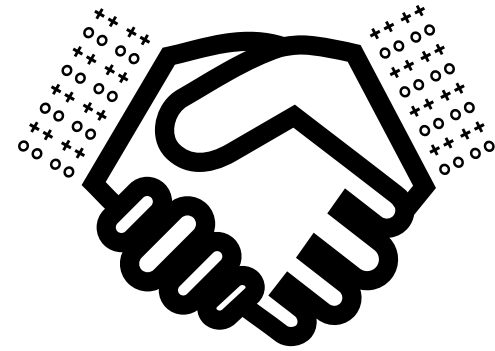
Although this may sound trivial, getting the data you need is one of the hardest parts of the project, due to the myriad sources of pertinent data (machines, systems, people) and the complexity of tapping into all of it. In some cases, industry-standard methods of information exchange are helping (e.g., OPC UA, IPC CFX, and others), but still, all too often, it is necessary to develop bespoke solutions for individual systems or pieces of equipment. The problem is magnified when manufacturing is outsourced or distributed across factories and geographies.

To take decisions based on data, the most fundamental requirements are that the data be timely, trustworthy, and complete.



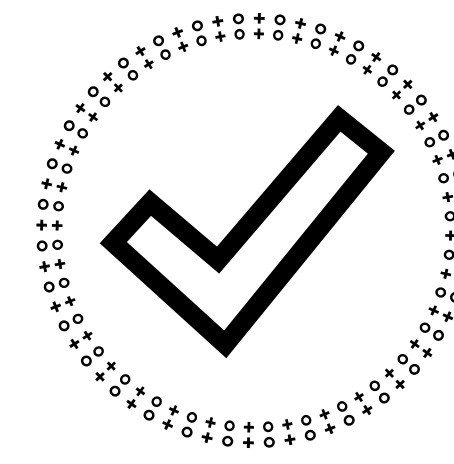
Timely

Data is valuable, relevant and useful when you get it quickly. You need live connections to equipment and systems to get the data on time.



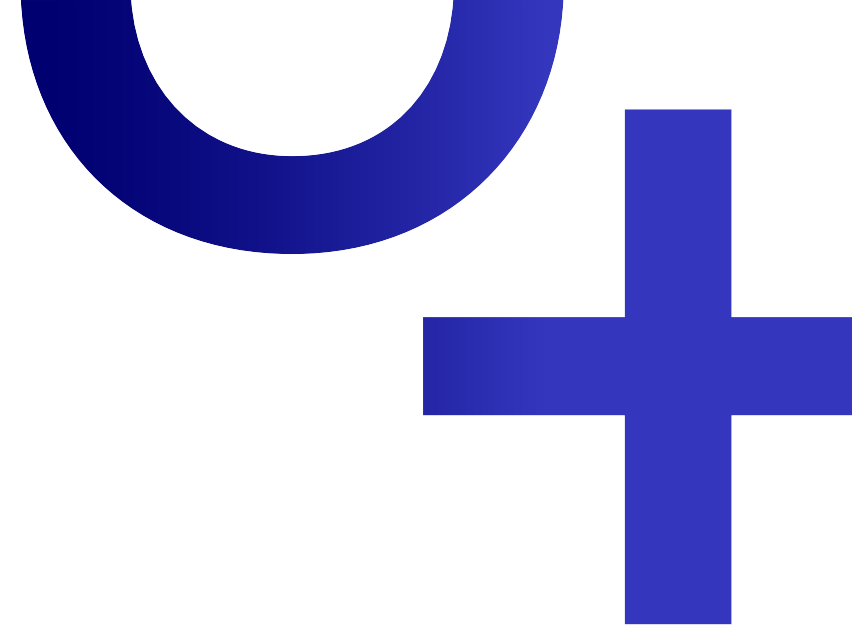
Trustworthy

If you can't trust the data, you can't make good decisions (a.k.a. "Garbage In, Garbage Out").



Complete

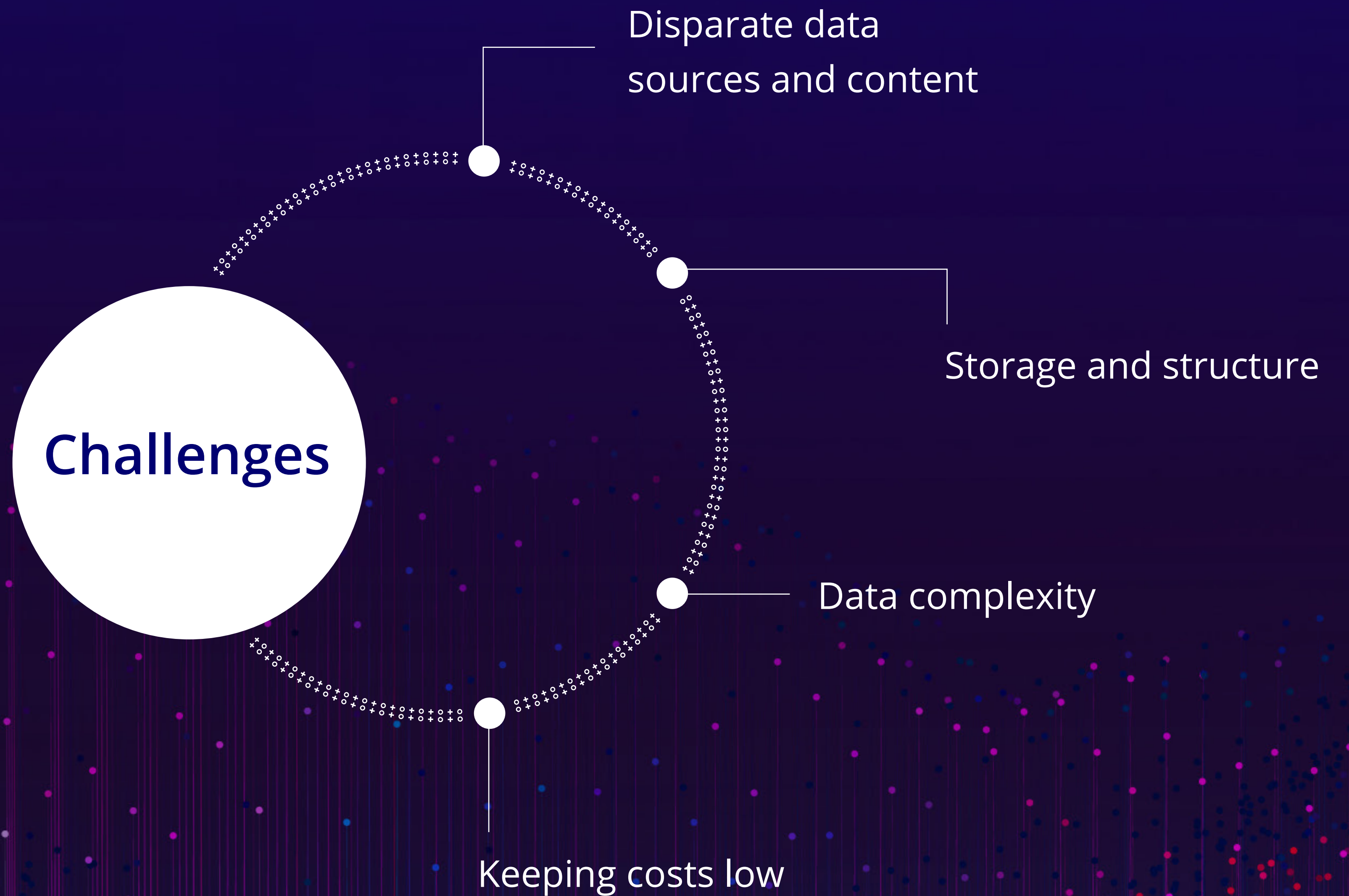
To ensure there are no gaps in the data, collection systems need to implement end-to-end tracking of data from source and alert if anything is missing.

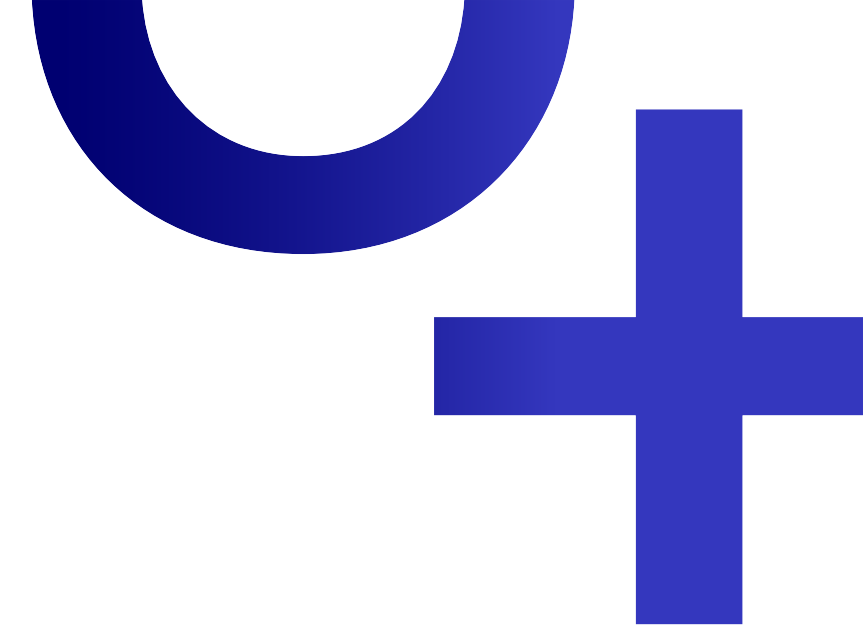


2

Organize the data

With data being generated in multiple formats across many disparate systems, it is often challenging to store and link it all together.





Disparate data sources and content

Data from different machines and systems typically differs in format, structure, and even content. For example, product identifiers used by an outsourced manufacturer may not be the same as the ones used by your internal systems. Even key metrics like “first pass yield” may mean different things to different people. It is critical to implement data governance mechanisms to resolve these issues and ensure consistent content, naming, and metric calculations across all data sources. A key outcome of this process is a “common language” across all data users.

Storage and structure

Some companies store all their data in a “data lake,” which typically keeps the data in its original format. However, this often makes the data difficult to query and analyze. A better approach is to structure data wherever possible and store it in high-performance analytics systems such as column-store databases. Designed properly, the analytics system and data lake can work in harmony to create a holistic view of all structured and unstructured data, no matter where it is stored.

Data complexity

To really understand the quality of your process and products, you need to combine data from across the entire production flow, and even include data from suppliers and customers wherever possible. Even simple products contain parts from many suppliers and are built by processes involving dozens of machines and systems. The schema of your database needs to be able to comprehend the relationships in your data and create a digital thread connecting all relevant machine, process, and product data for each manufactured product.

Keeping costs low

Data storage is expensive. Whether you put your data on the cloud or store it on-premises, the costs are significant. The problem is exacerbated in industries where regulatory or customer requirements involve retaining data for long periods of time. An ideal data platform will have multiple layers of data storage for long-term data retention, while still enabling quick access to aged data for analytics at the click of a button.

3

Analyze & present the data

There is so much data available, it can be daunting for users. High-tech factories today are generating upwards of 1 terabyte of data a day. It is therefore critical to summarize data and “bubble up” key insights so that users can see the big picture quickly.

This requires the execution of ongoing 24/7 analytics as data arrives so that KPIs can be calculated and presented to the user. Issues must be identified and prioritized, and the user must be given enough information to understand the problem and get to the root cause quickly.

Users need actionable insights

The ability to present the data in a simple and user-friendly manner is key to achieving user adoption of any analytics system. In some situations, this can be achieved through

standard Business Intelligence (BI) tools, like Tableau or Microsoft Power BI. However, for more complex engineering applications, it is often necessary to create custom applications designed to solve specific issues. In any event, the data platform you choose needs to support both types of access.

If the data is well summarized and presented in a clean and understandable way, it will quickly lead to “democratization,” enabling users in many roles across the organization to benefit from this single trustworthy version of the truth.

4

Automate analytics

When data is available immediately and analyzed automatically and quickly, you can begin to consider end-to-end automation based on the outcome of the analytics. There are many applications that can benefit from this capability, like adjusting settings on equipment based on incoming material, identifying outliers, classifying defects in inspection images, placing suspect products on hold, and adaptively changing test recipes based on data from previous manufacturing steps. Manufacturers who implement these capabilities can lower their costs while significantly improving their quality and efficiency.

This is true smart manufacturing!

5

Innovate

Let your imagination run wild and make the most of the latest and greatest analytics tools and techniques.

When you have an infrastructure that collects and organizes your data, makes it available at the click of a button, and can deploy and execute analytics in and between factories, you have all the ingredients you need to let your imagination run wild and make the most of the latest and greatest analytics tools and techniques.

Today, companies realize that the key to maintaining a competitive edge lies in artificial intelligence and machine learning. They are racing to recruit data scientists with the know-how and experience needed to turn data into deep and meaningful insights.

Your data platform needs to support their efforts by:

- Providing them with the data they need reliably and instantaneously.
- Enabling them to model data using the latest open-source and proprietary tools.
- Empowering them to deploy and monitor their solutions into the manufacturing environment.

Summary

