

# How to apply lean manufacturing to data management

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## Your manufacturing plant produces more than just goods. It's also a data factory.

Every asset, product, process, and system on the plant floor creates and contributes to a staggering volume of data. One ControlLogix PLC alone can produce tens of thousands of data tags. According to IBM, the average factory generates **1TB of production data** every day.

While plant floor data has always been used for process control, it's increasingly being leveraged by teams across the enterprise to improve product quality, reduce waste, predict maintenance, prevent downtime, and deliver new services and products to customers. Manufacturers who have adopted the Industry 4.0 mindset—or who are at least on their way—are beginning to “manufacture” information from this raw data.

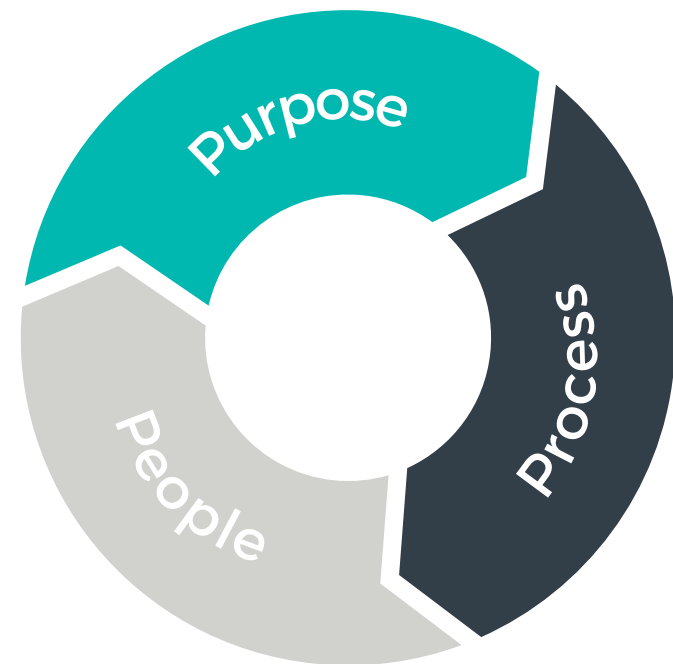
But we all know raw, unstructured data has its challenges. Because it was never intended to be used beyond process control, the data is not correlated for use by enterprise systems in the cloud. It lacks context and standardization. It must be modeled in motion. It may be unstructured or structured in a variety of ways (e.g., machine, transactional, and time series). The volume, velocity, and variety of raw industrial data are unparalleled and ever increasing. In short, it's a difficult raw material to work with.

# Purpose, Process, and People

Fortunately, manufacturers already have the framework they need to optimize data production and preparation. The same lean manufacturing concepts that have transformed manufacturing over the past three decades also apply to data management.

Consider the three key steps of lean, [as defined by James Womack and Dan Jones](#), two of the founding fathers of the lean movement. According to the Lean Enterprise Institute (LEI), they include purpose, process, and people. Let's take a look at the three steps and how they can be applied to lean data management.

**1 Purpose.** A lean initiative should target a customer value, such as price, quality, or product availability. Information production is no different. Manufacturers should think about who and what their data is serving. Different customers in the organization need access to this information to solve a variety of issues. Some of these internal stakeholders might include quality assurance, maintenance, finance, supply chain management, or order management.



## 2

**Process.** After defining the purpose, manufacturers can focus on how they will deliver on their objective. In lean manufacturing, we refer to this as value stream mapping, which typically involves product and process development, fulfillment, and product/customer support. According to LEI, each process should demonstrate value to customers, be capable of producing positive results, be available when needed, enable continuous flow or operation, and have the flexibility to move multiple types of products without batching or delays. Here's a look at how manufacturers can apply similar principles to data preparation:

- **Map the data flow:** In this analogy, manufacturers are looking for ways to reduce architectural complexity commonly found in industrial environments where multiple systems are delivering data across the organization. The process may also reveal security gaps and technical debt, which occur when manufacturers have deployed software using the fastest, easiest code available without consideration for future technology needs. This creates inefficiencies when trying to connect new systems and maintain them over the life of the factory.
- **Create data flow:** Here, manufacturers are looking at ways to prevent interruptions to data by establishing standardized data models of machines, processes, and products before moving that information to consuming applications, such as an ERP or business intelligence system. The organization must contextualize thousands of industrial data points by merging them with information from other systems, adding meta data, standardizing data attribute names and lists, and normalizing units of measure.
- **Establish a pull system:** This is a type of signal-based system, often using color-coded cards or lights, commonly used for material replenishment. When this concept is applied to data, lean tells us the operations team doesn't need to push all data to IT. Instead, the organization targets a specific use case and defines how it plans to receive that information based on a set frequency, event, or on-change (such as time-series data). This ensures that manufacturers only store and process the data they need to accomplish that use case in the cloud before moving on to the next use case. This pull system can be accomplished with a modern data operations (DataOps) software application.

**3** **People.** To keep lean projects on track, Womack and Jones suggest “frequent improvement cycles for each process” and the creation of a dedicated value stream manager. The same concept holds true for data preparation, though in this case we’re homing in on data governance and cross-functional communication. Manufacturers will need to determine who will oversee the data project and get it past the pilot stage. New jobs titles like data engineer, solution architect, and digital transformation director are becoming more popular in manufacturing to meet this cross-functional skills demand.



## Enabling Lean Data

**Like lean manufacturing, lean data management requires the orchestration of people, processes, and technology. These technologies include cloud services, AI, edge computing, brokers, and DataOps applications, just to name a few.**

Industrial DataOps is a relatively new approach to data integration and security that aims to improve data quality and reduce time spent preparing data for use throughout the enterprise. But instead of delivering parts or finished goods to customers, manufacturers leverage DataOps to deliver trusted, ready-to-use data to all the systems and internal stakeholders who require it.

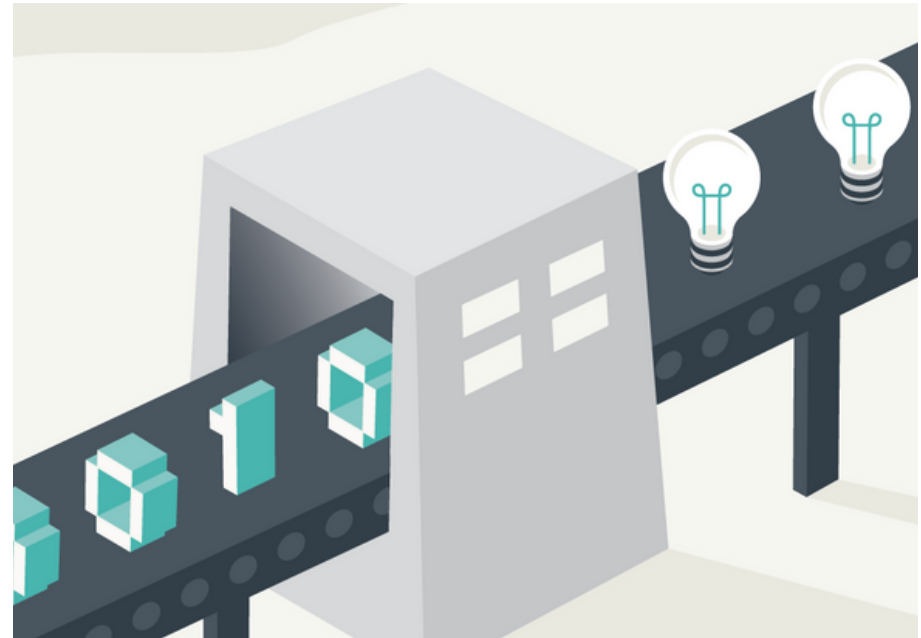
DataOps applications enable the user to create scalable models that standardize and contextualize industrial data. They enable users to collect and merge data from multiple sources and then transform it to a format that other systems can consume. This means manufacturers get the data they need when they need it. DataOps reduces waste by eliminating time-consuming custom coding and manual, redundant data preparation. Lean approaches to data management can help manufacturers deliver, analyze, and store only the most relevant, high-value data with the context they need to make strategic decisions.

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**Perhaps most importantly, DataOps changes how people collaborate around data. It can close the gap between data strategy and execution. DataOps applications offer a tangible collaboration solution for OT and IT to work together on industrial data integration and governance projects.**

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If data is the raw material of business, the plant floor is ripe with this resource. Let's use the tools that have transformed manufacturing over the past three decades to transform our industrial data into information and open the doors to the lean data factory.



## About The Author



Torey Penrod-Cambra is the Chief Communications Officer of HighByte, focused on the company's messaging strategy, market presence, and ability to operationalize. Her areas of responsibility include marketing, public relations, analyst relations, investor relations, and people operations.

Torey is a marketing professional with nearly 15 years of experience creating compelling brand experiences that drive customer acquisition and expansion in highly technical environments. Torey's career began with a focus on biotechnology and international pharmaceutical product launches, and then evolved into a fast-climbing career in B2B industrial software. She is passionate about securing equal STEM opportunities for women, and excited by the potential of the Internet of Things in industrial environments.

Torey applies an analytical, data-driven approach to marketing that reflects her academic achievements in both chemistry and ethics. Torey received a Bachelor of Arts in Chemistry from Miami University in Oxford, Ohio and has completed post-graduate studies in Medical Ethics at the University of Pittsburgh.

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## About HighByte

HighByte is an industrial software company in Portland, Maine USA building solutions that address the data architecture and integration challenges created by Industry 4.0. HighByte Intelligence Hub, the company's award-winning Industrial DataOps software, provides modeled, ready-to-use data to the Cloud using a codeless interface to speed integration time and accelerate analytics. Learn more at <https://highbyte.com>.