



5 steps to enabling a cognitive, data-driven, smart factory

The top strategic objectives in the manufacturing industry have remained consistent for years, with many centered on serving customers. Industrial companies want to deliver customers high quality products, on time, at a globally competitive cost. They also want to be able to flex production capabilities up and down as needed quickly introduce new products to the marketplace.

The top industry factory optimization drivers:

61% – Ensuring consistent quality

55% – Responsiveness to customer order demands

52% – Increasing production capacity & capabilities

The top challenges in manufacturing span people, processes, and technology:

48% – Lack of collaboration between departments

39% – Disparate systems and data sources

39% – ROI justification for improvement investments

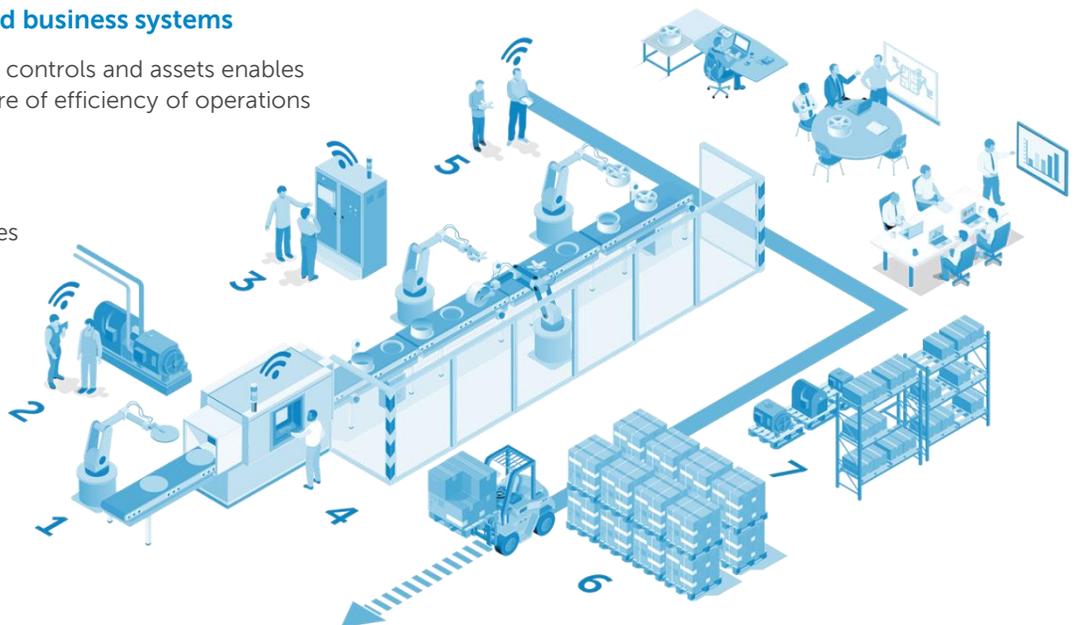
Pairing physical assets with intelligent gateways to gather, analyze, and communicate data is driving enormous new efficiencies in manufacturing and business operations. New operational efficiencies enabled by the Internet of Things (IoT) are generating significant returns in manufacturing.

Source: LNS Research

Integrated assets, operations, and business systems

Converged sensors, instrumentation, controls and assets enables manufacturing companies to be aware of efficiency of operations and take action to:

- 1 Improve asset utilization
- 2 Reduce downtime, predict failures
- 3 Improve quality and capacity
- 4 Improve workforce efficiency
- 5 Optimize decision making
- 6 Improve inventory management
- 7 Reduce MRO inventory



IoT-enabled, smart factory optimization pillars:

Connectivity: With the ability to connect to everything it is important to determine required data, and the processes and operations needing improvement. Then collect and curate relevant structured and unstructured data, across systems.

Cloud: Accelerate implementation and time to value via cloud data centers located globally to provide a secure, scalable, and flexible environment.

Analytics: Apply advanced analytics to gain new insights from manufacturing data. Dashboards visualize data patterns to quickly assess equipment performance.

Application Development: Accelerate innovation and deliver high-quality products faster with agile-ready software development solutions

These pillars are transforming manufacturing through:

Intelligent assets and equipment, cognitive processes and operations, smarter resources and optimization

This drives cost savings and the ability to improve:

- **Asset visibility and reliability** – Reduced downtime, improved utilization and design, reduced MRO inventory
- **Product quality and traceability** – Reduced scope and impact of adverse events, improved quality and yield of products, enhanced manufacturing operations
- **Resource efficiency and safety** – Improved workforce efficiency, increased safety and production capacity



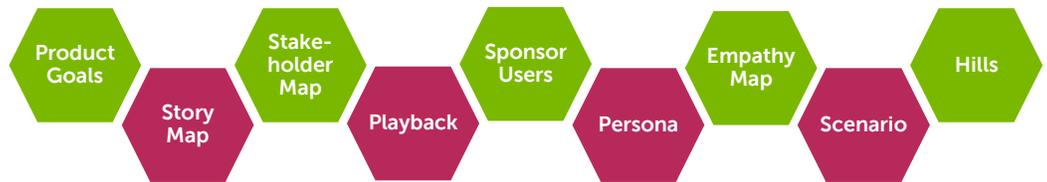
Follow these 5 best practice steps to plan your project implementation

1 | Establish a project success model

Choose an initial project that proposes a solution with a strong project delivery methodology to enrich and complement business processes. A strong recipe for success is to understand how other projects have missed the mark. Build the underpinnings of the organization, the people and the process so that the technology can be delivered in a way that provides specific value on a schedule that meets the organization's needs. Consider these key project goals to ensure your success:

- Start with a well-defined problem to attack
- Get support by stakeholders who have the right expertise to get the problem solved
- Determine ownership within your IT and OT organizations
- Establish the ROI value and key project milestones
- Focus on projects that can transform both adoption of new technologies as well as improvement of business processes

IBM Design Thinking enables rapid production of concepts and prototypes that can then be launched in Agile Proof of Concept projects.



2 | Build on a strong foundation of data

Determine what data you need and which processes and operations you would like to improve. Collect and curate the right data—both structured and unstructured — that you already have readily available in your systems, then add sensors to bring in real-time data that you currently do not have. Real-time insights give context through integration with systems that contain master records about equipment such as the make and model, when it was purchased, when it was put into service, as well as historical information about repairs and maintenance. This information provides valuable context which enables a greater level of understanding about how things operate throughout the factory. By linking these types of data sources together with IoT data from devices and sensors, you can gain even greater insight into their performance and health.

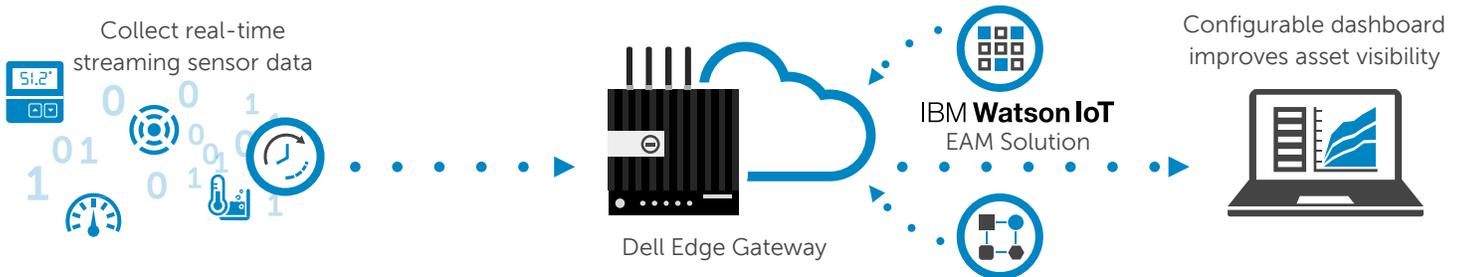


Type	Real Time Structured/Unstructured (Streaming from asset)	Big Data (Batch) Structured (Databases, systems)	Big Data (Batch) Unstructured (Free-form, raw text)
What	Measurement, control, videos, temperature, sequences, tweets, telematics, environmental,	Asset name, location, production line information, spares inventory, costs	Inspection reports, maintenance and operator logs, survey reports
Where	Sensors, PLCs, DCS, HMI, SCADA systems, drives, controls, instruments	EAM, SCADA, financial systems, data warehouses, ICS databases, MES systems	Business systems, workstations, email, social media, notes



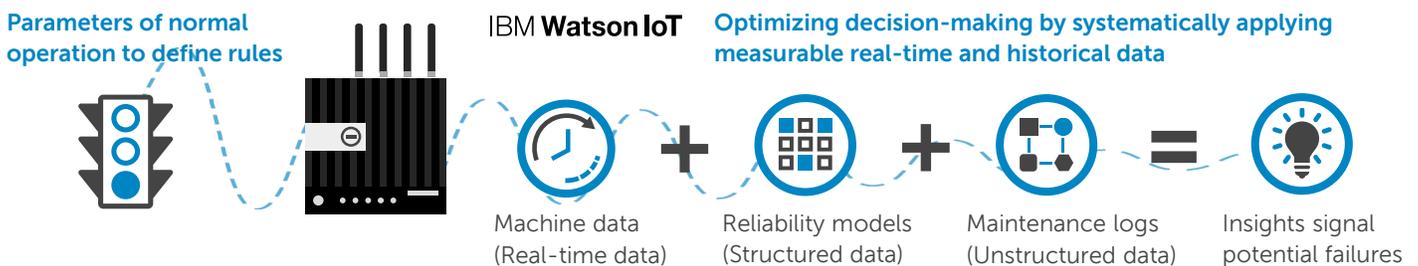
3 | Gain contextual visibility into operations

Often, you just need to see what's happening now—where are all my things, what alerts were triggered during the last shift, how is that asset we repaired yesterday performing? The intelligent Dell Edge Gateway provides a contextual view of all of your assets and devices. The solution also provides a map of device and asset locations, historical logs, reports, health and condition. All of this is delivered through a configurable dashboard, allowing users to tailor real-time visualizations to their specific needs and functional responsibilities. By capturing granular and contextual data traversing the network, manufacturers traditionally impeded by a lack of interoperability are now able to apply network policies throughout the extended production process, tracking manufacturing performance across edge, data center and cloud environments. This also allows sharing of actionable data with the appropriate personnel, vendors, and partners, to inform and improve decision-making.



4 | Apply rules and analytics to identify issues

From simple thresholds to more complex correlations, rules and analytics can monitor the ongoing conditions of equipment, operations and even the surrounding environment. Known conditions such as normal operating or expected usage patterns can be reflected in rules that trigger when these conditions are breached. However, there are challenges in terms of the volume and variety of the devices and data which traditional rules engines are not designed to handle. The Dell Edge Gateway providing data to the IBM Watson IoT Platform delivers a highly scalable, parallel processing rules engine which is designed from the ground up for IoT data. This solution also provides an intuitive, visual rules editor that can be used by a wide range of users, from business users and technicians to more advanced IT users. For more complex situations, users can apply advanced predictive analytics to gain new insights from IoT data. Industry specific models coupled with prediction engines can detect correlations in manufacturing variables that result in failure thus predicting and prescribing recommendations to resolve issues before they occur.



5 | Automate actions when issues arise

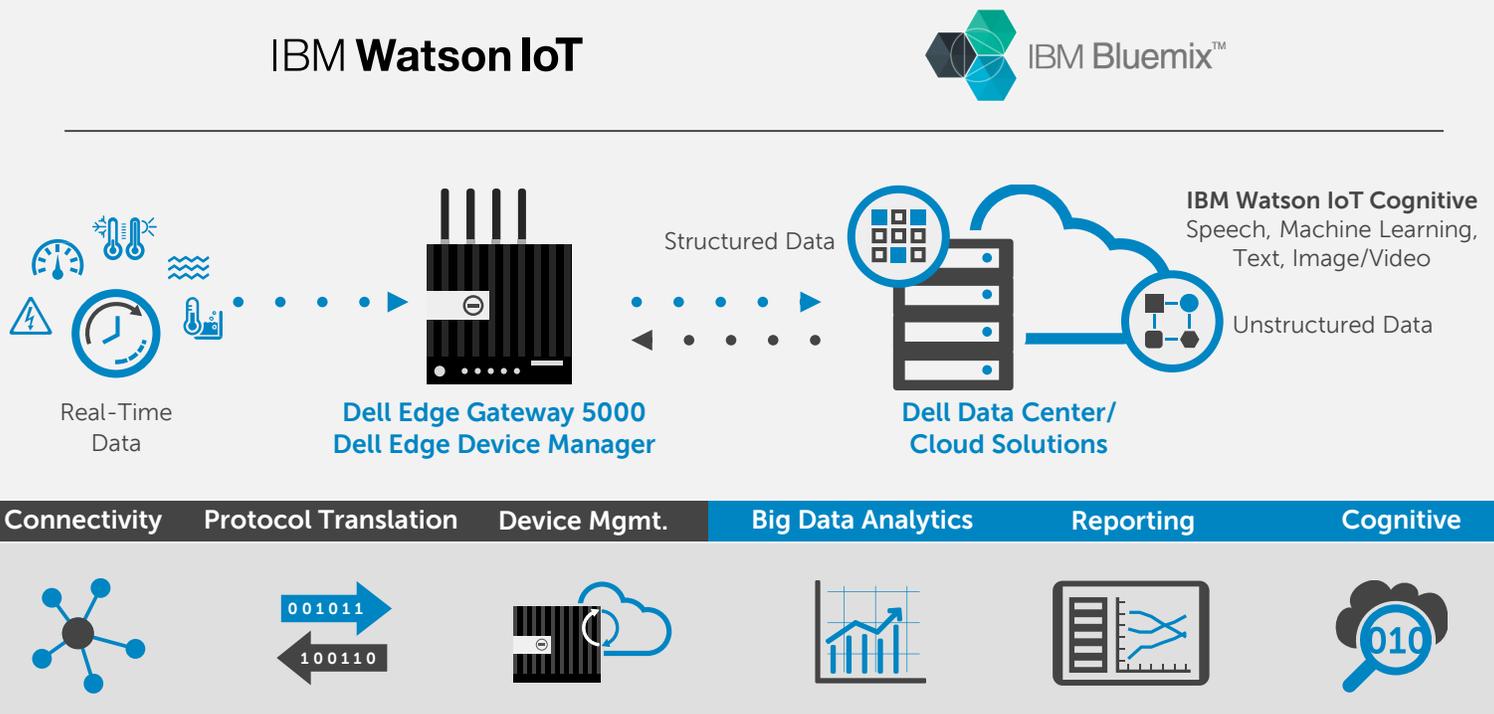
As previously mentioned, the scale of the IoT demands an increasing amount of automation. There are simply too many sensors and devices and too much data for manual processes and a "business as usual" approach. You need to automate responses to abnormal conditions and issues. The Dell Edge Gateway and IBM Watson IoT Platform solution provides an action engine that can do very basic tasks such as send an SMS message or an email when a rule is triggered—but it also allows you to take actions through external systems. This combination provides a closed loop response to issues in the operational environment, while providing traceability from the sensor data to the asset to the response all through a flexible automated process.



Factory optimization solution example

This example represents a single solution provided by the industry leading partners below as a reference. Your specific application may involve a combination of these and other technology providers within our IoT partner ecosystem.

To provide a blueprint for to help you build your factory optimization deployment, Dell has developed a flexible architecture centered around the Dell Edge Gateway with IBM for a complete solution. The [Dell Edge Gateway 5000](#) enables you to collect, analyze, relay, and act on real-time data from machine sensors and generate accurate, dynamic predictions. The Dell Edge Device Manager running on the gateway allows managers to deploy, group, and securely manage connected gateways regardless of their physical location. When combined with IBM Watson IoT running on IBM Bluemix the Edge Gateway running the Intel® Atom™ processor provides visibility to diverse data sets from PLCs, RTUs, meters, and SCADA systems. This creates the foundation for factory optimization applications. This edge solution securely communicates to your local data center or cloud, enabling you to integrate structured and unstructured data to refine your factory optimization model. In either the cloud or data center, the Watson IoT cognitive analytics solution enables you to run big data analytics on the structured and unstructured data to identify even greater opportunities to increase efficiencies. Tying in the IBM Maximo Asset Management application provides world class Enterprise Asset Management for reporting, generating alerts, and automating maintenance dispatching.



Along with our IoT Solutions Partners, we provide technology you can trust to help you get started quickly and efficiently.

Dell takes a pragmatic approach to the Internet of Things (IoT) by building on the equipment and data you already have, and leveraging your current technology investments, to quickly and securely enable analytics-driven action.

The Dell IoT Solutions Partner Program is a multi-tiered partner ecosystem of technology providers and domain experts to complement Dell's broad portfolio of IoT-enabling technologies.

To learn more visit us online at: www.delliotpartners.com

Contact Dell Sales to learn more about the Dell Edge Gateway 5000, our ecosystem of qualified partners, and to deploy this flexible predictive maintenance solution today.



IoT Solutions Partner Program

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