

Your Definitive
Roadmap

to



Digital Transformation
& Innovation in
Manufacturing

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Your Definitive Roadmap to Digital Transformation & Innovation in Manufacturing

Growth and productivity within the manufacturing industry have always been driven by innovation. Historically, the introduction of the wheel, steam engines, and, more recently, lean manufacturing methodologies coincided with growth spurts across the industry. However, by the turn of the new millennium, global labor productivity growth was in decline, and the tenets of lean manufacturing no longer did the trick. In 2011 a new framework that leveraged the digitization of data and highlighted the importance of automation was born.

This framework introduced the fourth Industrial revolution (Industry 4.0) and the importance of interconnected manufacturing systems where data collection, sharing, and analytics are executed by implementing digital transformation initiatives. These initiatives cut across the value chain of manufacturers and can be simplified into the following categories:



- Digital factories
- Smart products – Subscription economy
- Resilient supply chain
- Carbon neutrality across the value chain

Chapter 1 – Data and the Digital Transformation Paradigm Shift

“Digital Transformation is the adoption of digital technology to improve efficiency and accelerate growth.”

Struggling to keep up with the competition, Henry Furnese, a banker and industrialist, decided to collect all the information he could find concerning the industrial market of 1865 and his customers' requests to understand local trends. Leveraging his hoard of collected information, Sir Henry was able to predict future trends, make informed decisions, and beat the competition. The first recorded usage of “business intelligence” introduced the importance of data analytics and its transformative capabilities.

Today, almost every organization has implemented digital data collection processes to improve decision making, as these statistics show:

- **Approximately 91% of organizations have adopted digital-first business strategies.¹**
- **98% of manufacturing enterprises intend to apply digital solutions to improve data collection processes.²**

In an industry known for its unique challenges, such as its low-profit margins and competitiveness, the widespread adoption of digital technologies was not a surprise. Manufacturers embraced digital technologies to develop strategies that improve operational processes at:

- **The asset level – for individual equipment**
- **Facility level – from interconnected assets**
- **Process level – from interconnected production processes**

Developing and implementing data capture and analysis strategies at these levels defines the digital transformation in manufacturing.



Embracing the Digital Transformation

The paradigm shift from manual data collection processes to utilizing digital technologies empowers manufacturers with the tools to capture data across the entire production process. Now, manufacturers capture data directly from customer demand cycles, the supply chain, and available inventory to individual equipment and the production line, leading to the generation of big data sets.

Examples of these big data sets include the performance log from singular shop floor equipment, which generates approximately five petabytes of data in a week.³

Extrapolating this size of data to account for every data-producing source within the shop floor provides a glimpse into the amount of data to be handled when developing digital transformation strategies.

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Currently, the large data set that manufacturers produce can be divided into two categories:

- **Unused or Dark data – This makes up 80% of all collected data sets.⁴**
- **Utilized Data Sets – Approximately 20% of all collected data is used to derive insight.**

To reduce the prevalence of dark data, a robust digital transformation roadmap is required. The roadmap must take into consideration the specific manufacturing processes or assets to boost and digital technologies required to accelerate productivity.

The Manufacturing Industry's Challenges



Market Fluctuations:

Disrupted supply chains, fluctuating customer demand, political challenges, and a pandemic continue to create scheduling and operational challenges for manufacturers.

Low-profit Margins:

Manufacturers must balance increased material, labor, and energy costs against the value expectations of customers when setting prices for finished goods.

Customer Customization Requirements:

Increased requests for customized products require flexible scheduling and inventory management to meet customization requests.

Unscheduled Downtime:

Equipment failure, staffing challenges, and material handling issues create scheduling issues that affect productivity.

Chapter 2 – The Digital Transformation Roadmap

“75% of digital transformation implementations fail due to inadequate implementation strategies.”

Developing and implementing a digital transformation strategy or program requires a thorough examination of your enterprise’s capabilities and extensive planning. The evaluation process focuses on analyzing the manufacturing system to identify crucial processes that can be optimized by implementing a data-driven approach. Once identified, a digital transformation plan can then be developed to capture data, analyze the collected data, and implement data-driven recommendations.

The recommended roadmap for C-level decision makers, CTOs, CFOs, CEOs, COOs, and CIOs, includes the following steps:



1. Devising a Digital Transformation Blueprint

The digital transformation blueprint or plan is a comprehensive report from the evaluation process. The blueprint highlights:

- Areas of interest where data-driven strategies are expected to optimize productivity or eliminate operational bottlenecks
- Targeted returns on investment made
- Available budget for implementation



2. Identify Supportive Technologies

Digital transformation journeys involve the use of technology to capture and manage data. These digital solutions are divided into three major categories:

- Data collection technologies – IoT and edge devices, wearables, sensors, etc.
- Data storage solutions – Cloud computing platforms such as Microsoft Dynamics 365, etc., hybrid computing platforms, and on-premise data storage technologies
- Data analytics solutions – Production scheduling software, simulation modeling software, Digital Twins, and AI-powered analytical tools



3. Evaluate Skillset Availability

Delivering a successful digital transformation process requires the expertise of experienced hands to deploy digital solutions and derive insight. Hence, a capable workforce is required. Skillset evaluations ask the following questions:

- What's the current status of our IT workforce?
- Do we need to create a dedicated team for implementation?
- Can we up-skill the current workforce to handle the digital transformation?

The evaluation will determine if cross-training available staff or hiring new personnel will be required to execute the digital transformation strategy.



4. Launch

With a dedicated team in place and access to the right digital transformation solutions, launching the transformation strategy becomes the next logical step. The launch process should involve:

- Decision makers on the top floor
- Technicians and managers on the shop floor
- Testing the compatibility of new digital solutions with existing technologies on the shop floor
- Implementation assistance from digital transformation service providers if necessary

Involving everyone from the top floor to the shop floor eliminates any channel of conflicting ideas that can derail implementation.



5. Nurture the Digital Transformation Framework

Getting the entire organization invested in the outcome of the digital transformation process ensures everyone keeps track of key performance indexes to provide continuous feedback on progress. Feedback and collaboration across all channels, from the supply chain to individual workstations, ensures everyone is comfortable with learning, re-learning, and dealing with occasional failures.



6. Evaluate Implementation to Re-strategize

At the 18-month point, the digital transformation process should be making good progress, with some of the goals of the initiative being realized. At the stage where everything feels under control is the perfect time to accelerate the digital transformation process by extending the goals of the strategy.



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The manufacturing digital transformation market is expected to reach USD \$797.82 billion by 2026.”

Chapter 3 – The Technologies Your Shop Floor Needs to Implement its Digital Transformation Strategies

“The manufacturing digital transformation market is expected to reach USD \$797.82 billion by 2026.”

The ongoing digital transformation in manufacturing is occurring at an accelerated pace. In 2020 the digital transformation market in manufacturing was valued at \$469 billion and is expected to hit the \$1 trillion mark in 2025, with a compound annual growth rate (CAGR) of 16.48%.⁵

The digital transformation market consists of the data collection, storage, and analytical technologies required for deriving data-driven insight.

3.1 Data Collection Technologies

Accurately capturing manufacturing data improves the quality of insight gained from data analytics. Today, the more common data collection tools include:

- The Internet of Things (IoT) Devices – IoT supports the collection of data from relatively modern equipment and across industrial processes.
- Edge Computing Devices – Edge devices are pieces of hardware that control data flow at the boundary between two networks. These devices enable the capture of data from legacy equipment that are still a part of the modern shop floor.
- Wearables – Wearables support the collection and transfer of data from individual equipment to the person wearing it or to a centralized data storage platform.
- RFID Tags – These tags utilize smart barcodes to identify and track items such as inventory and its transfer across the supply chain.

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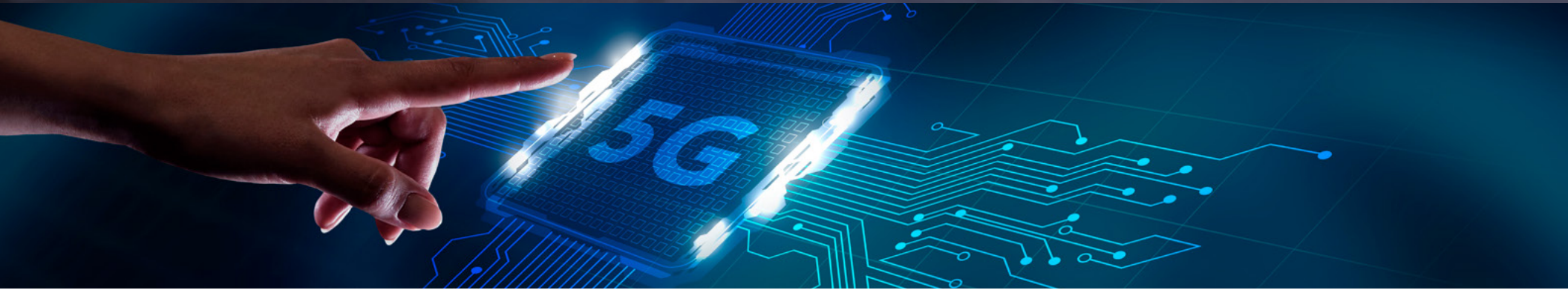
Capturing Data from Legacy Equipment

A large number of legacy equipment or assets are still being used across manufacturing shop floors. Capturing data from legacy equipment comes with its challenges. These challenges include:

- Older communication modules
- Incompatible proprietary software with more modern communication networks and IT platforms
- Incompatible hardware solution with more modern operational technology offerings

Plugging conventional IoT devices into analog I/Os to collect machine data is a difficult task, and so is connecting legacy equipment to wireless networks or through LAN ports. Alleviating these data capturing challenges is where edge devices have an important role to play.

Edge devices support the collection and transmission of data across network communication points. For example, a digital signal processor (DSP) can be plugged into legacy equipment to track the electronic signals the equipment produces to determine its working status.



3.2 Data Transfer and Storing Technologies

The concept of interconnectivity is a key aspect of Industry 4.0 because it maps out the communications that occur across the manufacturing system. Interconnected communications include machine-to-machine interactions, and data transfers across workstations and the personnel managing them. Data transfer and storage technologies include:

- Communication Technology/Wired Networks – Wired networks are widely used to drive machine-to-machine interconnectivity due to the reliability they offer.
- Communication Technology/Wireless Networks – The introduction of the 5G network is expected to drive the adoption of wireless networks due to the low latency and high bandwidth it offers.
- Cloud Computing Platforms – Platforms such as Microsoft Azure provide a scalable, centralized storage capacity that supports data storage.
- On-premise Storage – Localized storage platforms provide centralized storage capabilities for data storage.
- Hybrid Platforms – Hybrid platforms mix the storage capabilities of cloud and on-premise computing to store data.

The interconnected shop floor produces big data sets that require a centralized computing platform. Cloud computing platforms such as Microsoft Azure and on-premise storage solutions are equipped with the tools to store large data sets and support the deployment of analytical applications.

3.3 Data Analytics Technologies

Analyzing captured and stored data is a key factor in the digital transformation of manufacturing processes. Data analytics provide the insights required for decision making at the asset, process, and facility levels.

Digital analytical solutions empower manufacturers with the tools to model captured data to obtain applicable insights about optimizing processes. Examples of these analytical technologies include:

- Simulation modeling software – for risk-based scheduling and operational evaluations
- Digital twin platforms – for real-time monitoring, validation, and process evaluation
- IoT platforms – for predictive maintenance, monitoring, and strategizing
- Edge computing solutions – for real-time decentralized analytics
- Production Scheduling Software – for production scheduling, real-time scheduling analytics, and resource management
- Manufacturing Enterprise Systems – for process management, collaboration, and scheduling

Generally, these analytical solutions leverage vertical integration with data storage platforms to access manufacturing data and execute the required analyses.

Quisitive ShopFloor application's integration with Microsoft Dynamics 365 is an excellent example that showcases the relationship between an industry-specific data analytical solution and a cloud computing platform. For example, ShopFloor can connect the data flowing through Dynamics 365 and Azure to analyze the data and provide real-time insight into the equipment's health status through a comprehensive visualization dashboard.

Chapter 4 – Putting Your Data to Work

The manufacturing sector is massive and diverse. It includes the application of discrete manufacturing to produce durable items like automobiles and smartphones, process manufacturing to produce consumer packaged goods, and continuous manufacturing for chemicals and pasta. Yet, some truths cut across all market segments. Manufacturing companies are always looking for ways to:

- Innovate and speed up the development of products and services
- Increase the efficiency of production and operations
- Create products and services and product portfolios across generations
- Reduce operating costs
- Increase revenue
- Optimize how products are sold
- Exploit sustainability contributions of products and processes
- Ensure quality and regulatory compliance
- Ensure availability and safe operation of critical manufacturing assets, including autonomous assets
- Facilitate collaboration across siloed business functions and with external parties
- Improve customer experience

The digital transformation of traditional manufacturing processes and systems across the manufacturing value chain provides diverse solutions to achieve the objectives above.



The Digital Factory

The digital factory involves the use of advanced digital platforms to build agile processes that drive fundamental business changes. Digital technologies that support the development of a digital factory include MES and digital twin platforms. These solutions consolidate the data from your IT infrastructure and utilize intuitive dashboards and workflows to provide insight into the manufacturing process.

The data-driven insights digital factories provide become the vehicle for transforming traditional manufacturing processes that include:

- **Condition Monitoring and Maintenance**
- **Plant Optimization**
- **Lean Manufacturing**
- **Product Prototyping**
- **Material Handling**

Leveraging Smart Products and the Subscription Economy

Smart products that leverage the subscription model provide manufacturers with a regular income stream alongside the sale of produced goods to boost revenues. The average smart product is software-enabled hardware. The hardware is sold at a fixed price while customers subscribe to the software and gain benefits such as reduced expenditure, managing security, and certification updates. Integrating digital transformation empowers manufacturers to leverage the subscription economy through:

- Maintenance Packages
- Servitization

Developing Resilient Supply Chains

The digital transformation of supply chain processes enables manufacturers to develop supply chains with the capacity to withstand dynamic fluctuations caused by diverse external factors. These factors could be increased customer demand, the pandemic, political considerations, or the need for new business partners.

By leveraging digital transformation platforms, manufacturers can evaluate the effects of change and streamline collaborations with 1st, 2nd, and 3rd tier suppliers. By implementing data-driven policies, you can develop a digital supply chain to:

- Facilitate Collaboration
- Meet Sustainability Goals





Enabling Carbon Neutrality and Regulatory Compliance

The digital transformation in manufacturing empowers manufacturers with the tools to implement the IT concept of continuous integration, continuous delivery, and continuous development across the manufacturing process. The concept focuses on utilizing digital technologies to automate the application of sustainable plans and compliance policies throughout the production cycle. Leveraging digital transformation solutions ensures manufacturers can:

- **Develop a Carbon Accounting Framework**
- **Implement Carbon Neutral Policies**

Chapter 5 – Maximizing Your Digital Transformation Strategy

Once again, it is imperative to note that your digital transformation journey should be built around improving specific business processes. Creating manageable goals within your specified budget ensures you can adopt a modular approach to digitally transforming your manufacturing process. Here are some timely tips for getting started:

- **Choose Plug and Play Solutions** – Integrating new technologies such as IoT within your existing shop floor requires some level of reconfiguration. Choosing digital technologies with streamlined configuration processes eases the implementation of digital transformation initiatives.
- **Support Workers through the Transition Phase** – Your employees play crucial roles in ensuring the transformation process is successful. Providing a supportive transition playbook that incorporates simple changes before introducing more complex concepts will help employees quickly accept these changes.
- **Choose Reliable Technology Partners** – As a manufacturer, your core responsibilities and experiences are focused on utilizing equipment to produce quality throughput. Hence, securing the services of experienced partners speeds up the implementation process and ensures your transformation is always on the right track.



Client Story: Establishing a Digital Transformation Roadmap

The digital transformation experience of Leggett & Platt, a diversified manufacturer of engineering and household products since 1883, highlights how successful implementation improves business processes.

"The Quisitive team adds greatly to our confidence as we go live and embark on the digital transformation journey. I will be forever grateful that we found out ways to work together."

- Michael Blinzler, Vice President, Information Technology at Leggett & Platt

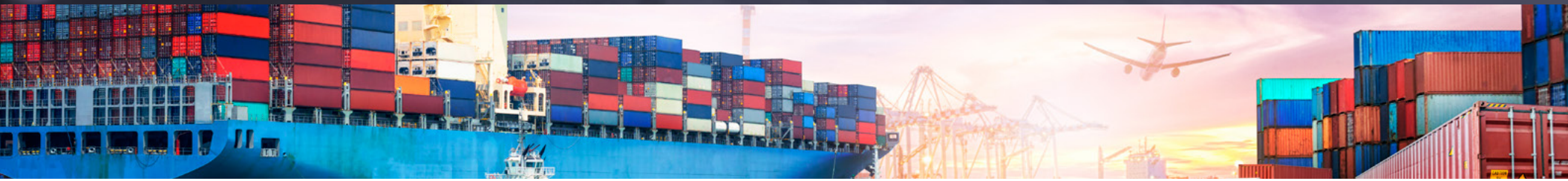
The Challenges

The manufacturer relied on legacy applications to manage its manufacturing operations, supply chain, inventory, and customer relations. These legacy applications hindered the enterprise's ability to gain real-time insight across its value chain, optimize its resource allocation processes, and deliver customer-centric business models that lead to revenue growth.

To eliminate these challenges, Leggett & Platt identified the need to revamp its legacy management processes by implementing a digital transformation strategy. The goals of its transformation strategy included:

- Developing a resilient supply chain
- Developing a connected shop floor to gain data-driven insight
- Improve resource management procedures
- Deliver environmental sustainability

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The Solution

To achieve these goals, Leggett & Platt recognized the need for choosing the right technology solutions and an implementation partner to support the deployment of data management and analytical solutions. The manufacturer intended to use the following solutions stack:

- Microsoft Azure – Capture and store data
- Microsoft Dynamics 365 – Capture and aggregate financial and supply chain data
- Microsoft Power BI – Visualize data captured by Azure and Dynamics 365
- Qusitive Shopfloor – Develop a connected digital factory using workflows and templates to analyze captured data and provide insight across its manufacturing value chain
- Qusitive – Support the transition from legacy applications and the digital transformation implementation

The Results

Leggett & Platt successfully implemented its digital transformation roadmap and developed a connected manufacturing process that improved its decision making abilities and customer satisfaction levels. Using its new digital capabilities, the enterprise:

- Reduced the effects of supply chain disruptions on its manufacturing capacity
- Receives data-driven insight across its entire interconnected manufacturing value chain consisting of 130 facilities in 17 countries
- Implemented an omnichannel distribution and flexible order fulfillment systems that increased customer satisfaction levels and delivered growth
- Ensured accountability across all levels of its value chain, from sourcing materials to product distribution

► **Relying on Qusitive digital transformation experts and using the right technology solutions enabled Leggett & Platt to successfully revamp its business process and achieve growth.**

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At Quisitive, we understand that every manufacturer faces industry-specific challenges in successfully implementing a digital transformation roadmap. Our experts can help you optimize your digital transformation journey regardless of the current status of your journey. Speak to a Quisitive representative today to learn how.

Learn more about how Quisitive manufacturing solutions can meet you wherever you are on your digital transformation journey.

Visit quisitive.com/accelerate-manufacturing to get started.

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