Smart Manufacturing Software

BUYER'S GUIDE

Rockwell Automation | PLEX

Why Read This Guide?

Manufacturing decision makers have traditionally looked to technology to raise efficiency and improve control of business operations. But as manufacturing continues to experience a revolution and a renaissance using industrial digitization, leaders are focusing more on finding the best software solutions to incorporate the benefits of smart manufacturing and manage areas of concern.

This buyer's guide will explore the benefits of smart manufacturing and help you make a confident and informed decision about solutions that drive results in your operation.

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LET'S GET STARTED

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Why Smart Manufacturing?

MESA International defines smart manufacturing as:

> *"The intelligent, real-time orchestration and optimization of business, physical, and digital processes within factories and across the entire value chain. Resources and processes are automated, integrated, monitored, and continuously evaluated based on all available information as close to real-time as possible."*

Manufacturing is changing rapidly. Demand is no longer consistent and predictable, and supply chain strategies are being wholly rewritten to address significant and continuing disruptions that have upended many traditional assumptions.

Demand shock alone has caused a complete shift in supply chain strategies with a return to concepts like buffer stocks, friendshoring, nearshoring, and reshoring that have taken precedence over the JIT strategies that had become the norm not so long ago.

The problem is compounded because the demand shocks have come from significant disruptions. COVID-19, tariffs, trade wars, inflation, and increasingly unstable supply chains have upended the previous stable supply chain era and caused chaos for manufacturers.

The result? Material shortages that were unheard of just a few years ago. Basic materials and critical component shortages have become the norm, resulting in manufacturers struggling to meet demand and operate efficiently.

These changes are also being driven by evolving consumer tastes and rising expectations from concepts like mass customization and lot sizes of one. To meet these expectations, companies must leverage data to become more agile, improve product quality and lifecycle performance, and shorten lead times.

Another major driver in the transition to smart manufacturing is access to and retention of skilled labor. Smart manufacturing technology allows companies to increase automation and optimize processes across the enterprise. The result is higher productivity and throughput with less labor.

Related to the shortage of skilled workers is the knowledge gap created by retiring employees. Many have legacy or earned knowledge that may not be passed down fully in traditional manufacturing. A modern digital strategy can capture work instructions and offer insights that can be shared among workers or used to automate production.

"If you always do what you always did, you'll always get what you've always got."

– Henry Ford

Addressing Manufacturing Challenges

As transformational as smart manufacturing technologies are, there are still challenges to adoption. Having witnessed the dawn of software in manufacturing applications, many managers and workers are wary of “yet another software solution.”

But smart manufacturing solutions represent a significant advance over traditional software systems.

In one real-world example, Swoboda US Inc. used a smart manufacturing system to automate processes and databases and consolidate legacy software.

Using real-time data enabled Swoboda to triple sales, double productivity, reduce inventory cycle count adjustments by 90%, and simplify processes to automate and minimize work instructions by 75%.

3x sales

90% reduced inventory cycle count adjustments

2x productivity

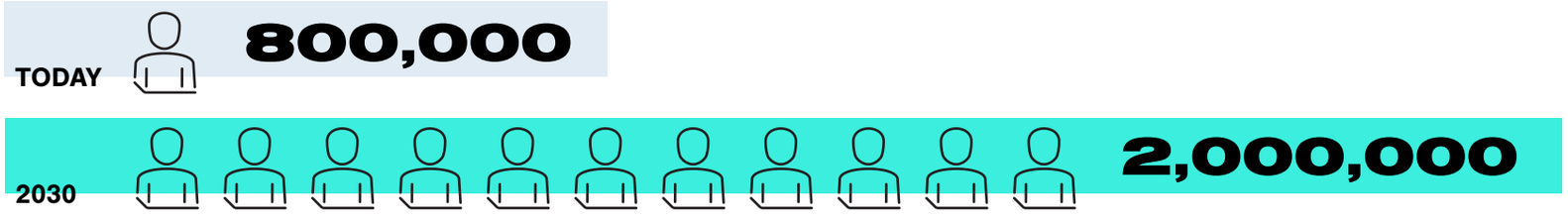
75% simplified processes and minimized work instructions

Companies like G&W Products are likewise adopting smart manufacturing systems to significantly reduce inventory and control material flows. These systems can also automate production processes to allow full visibility and traceability of materials in the supply chain.

Another challenge facing many companies is connectivity. Manufacturers rarely have one machine or type of machine. Legacy assets from multiple suppliers create an internal machinery ecosystem with various connectivity capabilities.

Some add-on devices can standardize data output across both analog and digital equipment to address connectivity issues, but care should be given to ensure they allow connectivity to all equipment and integrate seamlessly with any platform.

Manufacturers are also facing difficulty in recruiting and retaining qualified employees. **The skilled labor shortage is a ticking time bomb highlighted by over 800,000 manufacturing jobs in the U.S., and that number is expected to exceed two million by 2030.**



The impact on U.S. manufacturing could be devastating. The shortage limits more than just a manufacturer’s ability to produce finished goods; it also impacts the trajectory of smart manufacturing adoption.

Deploying a smart manufacturing platform will require changes to the existing workforce’s skill sets, changing how they work, communicate, and interact. And it will change how they respond when their actions impact production in or near real time.

Smart manufacturing is only possible if there are qualified professionals to fill the high-skilled jobs required to operate smart manufacturing solutions.

Manufacturing Trends

As disruption collides with advances in technology and software, there are incredible opportunities for those who embrace it to improve their performance.

Key trends driving the move to smart manufacturing include:

DIGITIZATION

As smart manufacturing technology advanced, it brought real-time performance and data insights where they were most needed. Digitization is a complete change in business processes from designing new products to how they're manufactured and serviced.

Operators and managers have full visualization of the factory or plant floor to monitor and interact with machinery down to the spindle or tank level to aggregate real-time performance reporting using advanced analytics.

EMPOWERED WORKFORCE

Visualization and greater data access empower workers to make better decisions in real time and optimize production processes using actual data rather than dated analysis.

In one example, Clips and Clamps Industries replaced data from six legacy systems with a single point of entry to eliminate paper-based tool tracking and allow workers to find the real-time data they needed with only a few clicks.

Workers became a vital extension of the power of data insights and could intervene faster when issues occurred. This extension improved decision making and efficiency and optimized labor utilization.

ESG AND SUSTAINABILITY

Environmental, social, and governance (ESG) concerns have grown as a trend across most industries, with a focus on sustainability.

Many industries are facing raw materials shortages driven by disruption from demand shocks. There is growing concern about scarcity as resources are used up, never to be available again. Smart manufacturing solutions enable precise monitoring of manufacturing at the plant floor level, allowing sustainability to be digitally tracked and optimized.

Technology Forces

Smart manufacturing encompasses multiple technologies, with more coming to market every year. **Core technologies include:**

Machine Connectivity – Traditional production monitoring was tedious and manual. Data generated by today's machinery can automate processes and even perform autonomous or semi-autonomous decision making at the machine level.

With smart manufacturing, machine connectivity connects data from the plant floor to software solutions like ERP, MES, QMS, and CMMS to produce data-driven, automated decisions that eliminate manual data errors.

Artificial Intelligence (AI) and Advanced Analytics – AI is expanding, and it's at the heart of smart manufacturing. Further advancements using AI include applied observability so that AI becomes prescriptive and predictive in its value.

Businesses are inevitably tied to their product performance and brand name. Adaptive AI will provide manufacturers with the flexibility to change their operating model or product strategy as customer feedback and product performance is fed into the cloud-based platform.

Machine Learning (ML) – Machine learning leverages data to improve performance and optimize processes. This learning involves algorithms that are trained to find patterns within data sets and make decisions and predictions based on the analyses.

Additive Manufacturing (AM) – Additive technologies like 3D printing can speed up and improve design iteration and lower the cost of spare parts. Deciding which parts or products can best utilize AM is the issue, but data and smart manufacturing make this possible. Analytics, simulation, and other variables can be quickly analyzed to determine whether AM can relieve a supply chain pain point as part of a hybrid solution.

Industrial Internet of Things (IIoT) – IIoT is a collection of technologies that includes analytics, edge devices, and advanced tracking and monitoring through sensors across production, supply chains, and distribution to create a fully integrated data ecosystem.

Digital Twins – Digital twins allow virtual product creation for design optimization, quality improvement, and the identification of weaknesses. This leads to improved product performance and less waste. As data from production and field performance is added to the data stream, digital twins will develop theoretical or "ideal" KPIs and help identify potential problems in the design phase of both product and business processes so that manufacturers can avoid them when rolled out.

Advanced Robotics – With critical labor shortages impacting manufacturing, robotics tied directly to a smart manufacturing platform allow faster and more precise production and may even facilitate "lights out" production for some processes.

Edge Computing – Deriving insights from plant and machine data requires massive bandwidth and computing horsepower. Many lower-tier functions and decisions can be configured at the point of the edge device, reducing overall bandwidth and leaving the most crucial analysis for the cloud platform.

Edge computing can pre-process and cleanse data before it's sent across a network to the cloud. Computer power in the cloud can then process the most critical data into insights.

Strategic Response: What Do You Need to Do?

Smart manufacturing is a powerful and game-changing reality. Start by ensuring systems and equipment are connected digitally. This connectivity enables you to automate processes, data collection, and other functions for faster and more accurate decision making. Digitizing, connecting, and automating helps create a digital footprint and record of everything in your environment. This information enables you to analyze any or all parts of the business for continuous improvement.

Smart manufacturing is also a **strategic decision** that directly impacts and improves a company's competitiveness and brand reputation. It's critical to assess what is required to begin and how a smart manufacturing platform will fit into your business.

CONNECT

Most manufacturers use different generations of production equipment. Connecting means understanding which machines have connectivity natively built in and which require additional devices or retrofitting to bring them online.

Machines with built-in network connectivity are ready for smart manufacturing. In contrast, machines with no network connectivity can be network-enabled by adding devices to convert analog to digital or tapping into the machine's embedded electronics and utilizing industry-standard network cabling.

Because smart manufacturing solutions can transform how data is used, the more equipment connected, the more effective the smart manufacturing system becomes. Full connectivity is the first step to getting control of data and leveraging it to optimize processes.

Once the equipment is connected, a robust smart manufacturing system will help eliminate data silos by bringing company, customer, and production data together under a single source of truth.

AUTOMATE

Automation is essential in modern manufacturing. Smart manufacturing takes automation to new heights by leveraging data and analytics to uncover trends not perceptible by human analysis and traditional data management.

When **Polamer Precision** implemented a smart manufacturing solution, CEO Chris Galik realized that the platform empowered Polamer to customize where other software didn't, stating that:

> ***"The system has enormous capabilities. We do things differently at Polamer Precision, and we were attracted to this software because we knew we would be able to tailor it."***

Automation may consist of simple task replacement like production tracking and paper-based quality monitoring. It can replace manual and error-prone tasks like manual data entry to reduce labor and improve data accuracy.

Quality sign-offs, work center setups, spec changes, automatic shipping notifications (ASNs), and more can be configured to speed up approval processes with status and approved documentation immediately available to users.

A machine's ability to stop when faults, alarms, and alerts are detected is critical for safety and quality. For safety, it means that operators and technicians have less chance of injury from debris, fire, and other hazards caused by equipment continuing to operate after a malfunction.

The same automation stops equipment or machine components when quality issues are detected. Smart manufacturing systems can monitor quality for speed, temperature, weight, and other variables depending on the equipment's sensor capability.

Strategic Response: What Do You Need to Do?

TRACK

Smart manufacturing systems connect to more than just machines and equipment; they also connect to people making decisions based on data and insights.

Businesses looking to expand their product portfolios and locations must have smart manufacturing software that can grow with them. This was the case with Olde Thompson, the world's largest manufacturer of salt and pepper mills and a leading manufacturer of private-label and branded dry spices and seasonings.

They needed a smart manufacturing platform for many reasons. They also needed an integrated supply chain planning solution that would track lead times for all their suppliers, enabling them to catch up on raw materials ordering and establish a safety stock for their growing customer base. They implemented a smart manufacturing software solution that digitized their environment and removed the guesswork from their planning process.

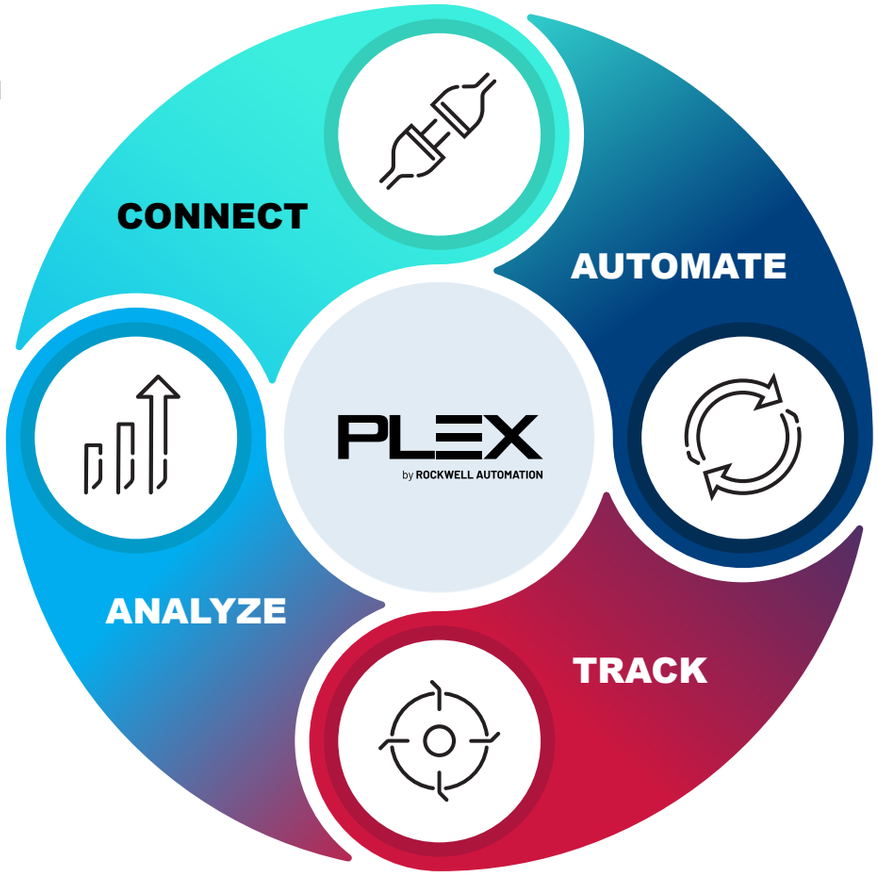
This connection across the entire smart manufacturing platform extends capabilities in deploying the best inventory strategy, assessing machine health for improved maintenance, identifying trends, making them available through reports, charts, and screen views, and measuring productivity from planning to production.

ANALYZE

Analytics are core capabilities of smart manufacturing. With powerful cloud-based analytics, decision-making is data driven and accurate. It's also faster than traditional analysis because it uses at or near real-time data.

Analytical insights provide actionable pathways for improvement. These trends indicate accurate representations of current vs. historical performance, allowing managers and staff to implement process improvement. Analytics also reveal hidden trends and help zero in on process problems that managers were previously unaware of.

Using analysis for process improvement and detecting trends unlocks hidden capacity, generates improved ROI on expensive capital equipment, and significantly reduces off-quality production.



Key Performance Indicators (KPI)s

KPIs derived from real-time data and advanced analytics have greater accuracy and a more significant impact.

KPIs can include:

- Production by shift, week, machine group, or department
- Quality by part or work center
- Machine maintenance and health metrics
- Operator performance
- Production against lead time
- Waste generated
- Quality fallout
- And many more

Manually tracking production data to measure KPIs is error-prone, biased, and subject to omission. There are only so many data points that humans can record without it creating additional labor. Automated data collection and advanced analytics allow dynamic measurement of KPIs with absolute precision.

One great example is production measurement. While counting units per hour is a great metric, with smart manufacturing, the depth of the measure can be extended to cover so much more. It can be tracked to the minute, analyzed over time to detect operator fatigue at specific points in a shift, and correlated with ambient temperature and humidity conditions to assess their impact. This depth provides manufacturers with previously unattainable metrics, enabling them to use more comprehensive KPIs to implement process improvements.

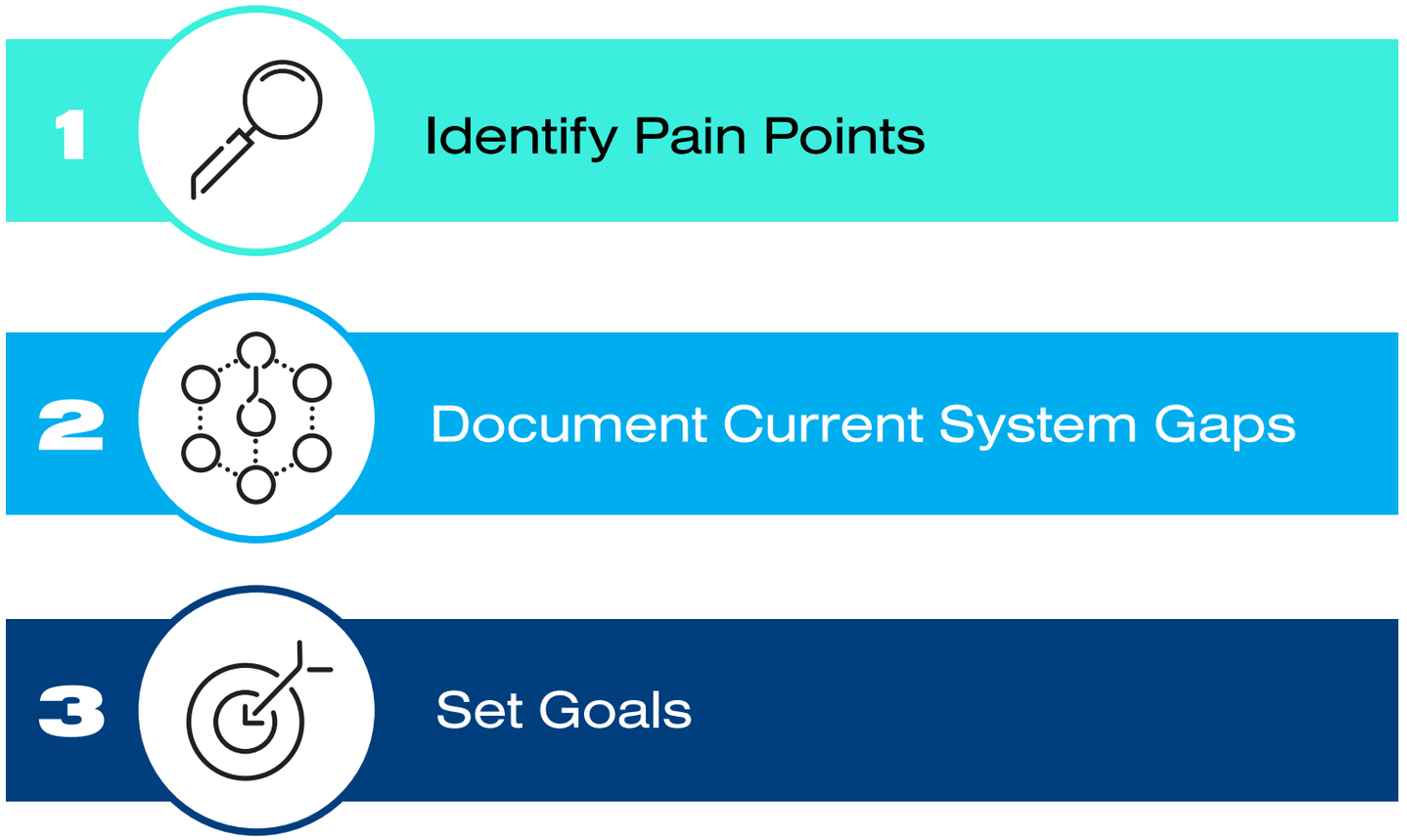
Getting Started in Your Smart Manufacturing Journey

The first step is to identify your biggest pain points. Executives, managers, supervisors, and operators usually know these well, having dealt with them for years. Identifying the top pain points guides decision makers and helps them identify how a smart manufacturing solution would reduce or eliminate these points.

Next, document where you stand with your current systems. They may be manual or utilize fragmented and disparate software, but start with what you know as a baseline. It may also have checklists for features, surveys, and deep dives into maintenance, inventory, and other areas that smart manufacturing will impact.

Finally, set goals for the smart manufacturing project. Do you begin with a pilot? If so, how many machines will you include? Are all machines in the facility capable of connectivity? If not, what is the plan to include them, and what is the cost? Is the goal to improve ROI or convince hesitant management? What will the data be used for?

Questions like this help you set clear, achievable goals. This process also begins laying the groundwork for costs outside the smart manufacturing platform, like edge devices, retrofitting legacy equipment for connectivity, and IT.



10 Steps to Technology Adoption

1. Identify key stakeholders and agree on your greatest need.
2. Establish effective governance with key stakeholders.
3. Make the business case for investment by aligning technology, strategy, and metrics/KPIs.
4. Create a communications plan that will sustain the vision for future desired outcomes.
5. Research and select your solution(s).
6. Assess your current capabilities, risks, and opportunities; benchmark yourself against your competitors.
7. Design and deploy the solution(s).
8. Prioritize changes that address the problem(s) you are solving, have the best ROI, and/or eliminate the most risk.
9. Establish and implement an organizational change management program and drive adoption.
10. Adopt a continuous improvement mindset and support it with messaging that highlights what you've learned, what can be more efficient, and how people drive change.

Implementing Smart Manufacturing

TACTICAL APPROACHES

A pilot program or trial can be very effective in moving past skepticism. Using the philosophy of 'picking the low-hanging fruit,' choose a real, glaring problem that everyone – from operators to IT staff – understands as a bottleneck.

By choosing a problem that everyone agrees on, participants will see that there is an attempt to ease a pain point. As the pilot progresses successfully, efforts to frame the discussion as a powerful harnessing of data and greater process automation instead of just another software system will help achieve buy-in. This sets the stage and makes a case for using smart manufacturing systems in all aspects of manufacturing.

SMART MANUFACTURING SOFTWARE DEFINED

There are many types of smart manufacturing software available. They can be used standalone or in combination as part of a comprehensive smart manufacturing solution.

Enterprise Resource Planning (ERP) - Automates front and back-office processes, including financial management, revenue management, human capital, order management, billing, and inventory.

Manufacturing Execution System/Suite (MES) - Tracks and documents the transformation of raw materials into finished goods, providing real-time production management to drive enterprise-wide compliance, quality, and efficiency.

Quality Management System (QMS) - Standardizes and automates quality documentation, processes, and measurements.

Supply Chain Planning (SCP) - Combines data from multiple departments across the business to sync demand and supply forecasting to optimize inventory levels and production management.

Production Monitoring - Provides seamless connectivity to machines on the plant floor, delivers transparent, real-time operational KPIs and dashboards, and drives continuous improvements.

Asset Performance Management (APM) - Combines process, operational, and machine-level data through dashboards to monitor machine and plant health, ensuring optimal uptime, throughput, and maintenance.

Smart Devices - Self and system-aware assets that acquire and process operating data – and monitor and report on asset conditions such as self-diagnostics and energy usage.

Implementing Smart Manufacturing

PRODUCT EVALUATION

One approach to evaluating a smart manufacturing platform is the creation of a checklist as the product of an internal audit. Every company should audit its processes to identify bottlenecks and areas for improvement.

A pre- and post-buy-in checklist defines the requirements of a solution and is the logical progression of platform implementation and post-implementation success measures. Each step highlights the necessary internal and external resources with timelines for utilizing those resources.

The checklist should be prioritized with weighted importance to the implementation tasks and goals so teams can tackle the highest-value items first. The audit should include project goals and set milestones, helping determine what needs to be done and how long implementation should take.

ORGANIZATIONAL ALIGNMENT

A top floor to plant floor approach is a practical strategy for getting buy-in. Top-down only strategies rarely work, as they alienate staff along the hierarchy and tend to exclude people on the plant floor who are vital to an initiative's success.

Bottom-up only strategies don't work, either. Floor operators, already performing manual tasks, may need to gain skills to implement a complex new platform. They need guidance, goals, milestones, and a way to realize the power of a smart manufacturing platform.

The pilot or trial used to convince an IT team must work across an entire hierarchy. Operators know the major pain points, and managers know which ones impact cost, quality, or productivity based on their current read of metrics and KPIs. Focusing on core pain points will become a catalyst for buy-in.

Based on immediate and data-driven analysis, managers will see quality improvements or efficiency increases. And operators will see long-dreaded issues start to improve. Grouping agreed-upon pain points together for a string of successes will help focus everyone from the top down on the power of data instead of the skepticism of new software.

A smart manufacturing platform will quickly prove that it's a significant step above traditional software. These successes will create champions along the hierarchy whose influence will help achieve buy-in with a ripple effect. Because the focus has been shifted to the data on the floor, employees and executives will discover more use cases and push for implementation throughout manufacturing.

Deployment Options

THE STRENGTH OF THE CLOUD

Cloud-based infrastructure continues to gain popularity. These require less in-house maintenance and management than traditional on-premises models, reducing the need to recruit hard-to-find tech skill sets. Servers are managed by the cloud provider, who will always have adequate storage volume to handle data and the analytics capability needed to process it in real time.

Cloud-based infrastructure also removes the need to plan for additional capacity as the company grows. Because the cloud is elastic, more data capacity is readily available as data volume increases or new manufacturing assets are connected.

Another cloud advantage is the ability to go global. Previous manufacturing monitoring and automation models required operators and managers to walk to a terminal to review data; transferring data to other facilities or remote users was time-consuming.

Cloud-based systems allow your data to go global when the system is deployed. With data centralized in one location, anyone with access will get a single version of digital truth no matter where they are or what device they use to access it.

ON-PREMISES SOLUTIONS

There are still companies that prefer or require on-premises solutions. On-premises solutions are viable for companies requiring heavy system and code customization to meet their specific situation or requiring local data residency.

On-premises solutions increasingly offer more remote access via mobile devices or remote clients, giving users higher degrees of access and flexibility. They require ongoing maintenance and upgrades, which must be accounted for in planning.

HYBRID SOLUTIONS

Many scenarios require a hybrid solution with some cloud-based elements and some on-premises needs. For example, managing machines, equipment, and processes on the plant floor requires on-premises equipment to connect to those machines, and monitoring production in real time requires the same.

If a manufacturing management solution – whether it's a QMS, MES, ERP, or all the above – is connected to plant equipment, it must connect to the plant to ingest and use that data to create insights. Manufacturers often opt for cloud-based versions of those solutions, which creates hybrid on-premises and cloud scenarios.

Other possible scenarios include companies with sensitive data requiring the localized storage of classified government products or those in hyper-competitive markets with many complex trade secrets and patents.

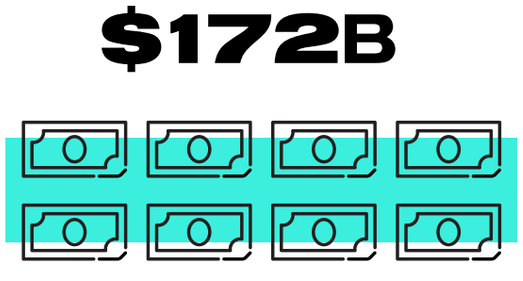
Security and Compliance

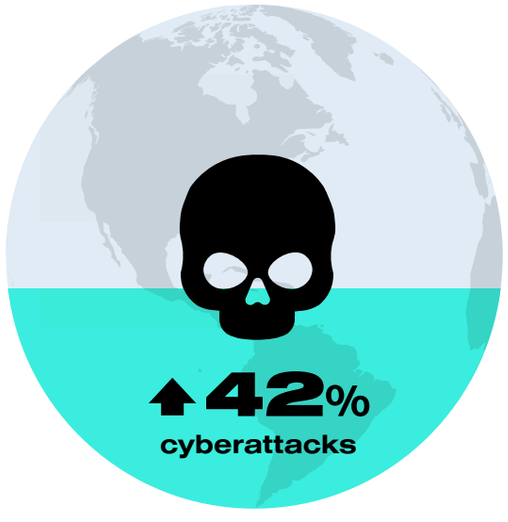
Security is one of the most critical considerations for selecting smart manufacturing solutions. As the digital revolution transforms manufacturing operations for the better, poor security can have a devastating impact and stop a company in its tracks.

Compliance is a significant concern as industries face more regulation of critical sectors like food and beverage, medical, pharmaceutical, and aerospace. Losing control of compliance or security through a breach or oversight is a terrible fate, and losing control of both due to selecting the wrong vendor could be catastrophic.

Few things in modern manufacturing alarm executives more than cloud-based security concerns. Gartner research shows cybersecurity budgets are increasing rapidly, with an estimated $172 billion spent per year. Many approach the benefits of cloud infrastructure as a trade-off with a higher risk of a data breach or worse.

Gartner estimates that $172 billion is spent annually on cybersecurity.





Even with this increased spending, the cyberattacks continue at an exponential rate. According to Check Point, by mid-year cyberattacks had risen 42% globally.

Security and Compliance

One especially frightening trend in recent years is the rise of ransomware. Ransomware occurs when a malicious actor uses advanced encryption in a data or system breach to take control of an entire system and lock a company out of its data and platform operations.

Using asymmetric encryption, the attacker stores the company's data on its server while generating a key that the company can use to retrieve it once a penalty has been paid. Penalties can include paying hackers to release the data, but in many cases, the data is lost while injuring the company and its brand.

Examples of ransomware infiltration include:

- Outdated versions of existing software, which are often vulnerable and create a window for attackers to enter a company's data.
- Malware downloaded from physical media such as a USB or external hard drive.
- False updates of reputable software like Adobe and others.
- Infiltration through video games.
- Attaching files to an email that will infiltrate when opened.

The best way to secure your data from malicious actors is through a carefully researched and informed vendor choice. But what does security and compliance protocol in a cloud-based platform look like? And how do you select a vendor whose emphasis is on keeping your data and manufacturing system secure? There are a few things to look for:

1. Performance – A vendor's track record will show their steps to secure their platform. The ISO/IEC 27001 certification is a good one to look for when it comes to cloud infrastructure data security. This international standard for information security means that a solution was meticulously audited to ensure that controls, protocols, and processes are wholly aligned with security best practices and standards.

2. References – A secure platform with automated compliance features should generate positive references. If a company has delivered on its promises for security and compliance, its customers will be eager to speak for them to assure others that the platform is secure and that compliance automation is seamless and fast.

Security Checklist

- [ ] Arm yourself with knowledge. There are countless whitepapers, seminars, and articles on ransomware that will help you defend your company.
- [ ] Implement stronger passwords and multi-factor authentication.
- [ ] Constantly review your access controls and privilege escalation with a “need-to-know” mentality.
- [ ] Segment your network. Don’t leave all of your valuable eggs in the same basket.
- [ ] Secure your security systems as you would other highest-value systems.
- [ ] Run intrusion detection and anti-virus software and keep them up to date.
- [ ] Encrypt data at rest and wherever possible, in transit.
- [ ] Backup critical systems and data and secure them separately from everything else. For your most sensitive data, back it up to multiple locations.
- [ ] Patch. Many systems in industrial settings are aging, so weigh the cost of upgrading against the cost of recovering from an attack. Understand that a failure to act means you will eventually be breached.
- [ ] Discontinue use of vulnerable protocols like TLS 1.0/1.1 as well as older, less secure ciphers.
- [ ] Know your environment. Maintain up-to-date architectural diagrams and asset inventory so you can quickly determine what devices may be vulnerable or need patching.
- [ ] Build an aware and empowered workforce that knows how to handle suspicious emails or activities, has quick access to an expert security team, and actively looks for problems.
- [ ] Review and validate security documentation and reports from your suppliers.

Security and Compliance

The confidence of having secure platform access and compliance documentation that meets mandated regulations while keeping production operations on track with instant updates is an invaluable tool for companies using a smart manufacturing platform.

Strong smart manufacturing systems use hardened firewall clusters to track changes and monitor threats. They also use advanced anti-virus, spyware, and intrusion detection that are updated daily, working seamlessly in the background. They maintain multi-layered solid security protocols so you can defend against ransomware and other intrusions while conducting “business as usual” with confidence.

COMPLIANCE

Compliance is a way of life for every industry. But in aerospace, pharmaceutical, food and beverage, and medical, regulations may require extensive compliance records like the chain of custody, expiry tracking, and more.

Traditionally, compliance tracking was predominantly manual, which exposed manufacturing to human error, time-lagged data, data bias, and other problems. Complex approval hierarchies could further compound these issues for change orders, design changes, substitutions, and other tasks that require approvals to closely follow production progress.

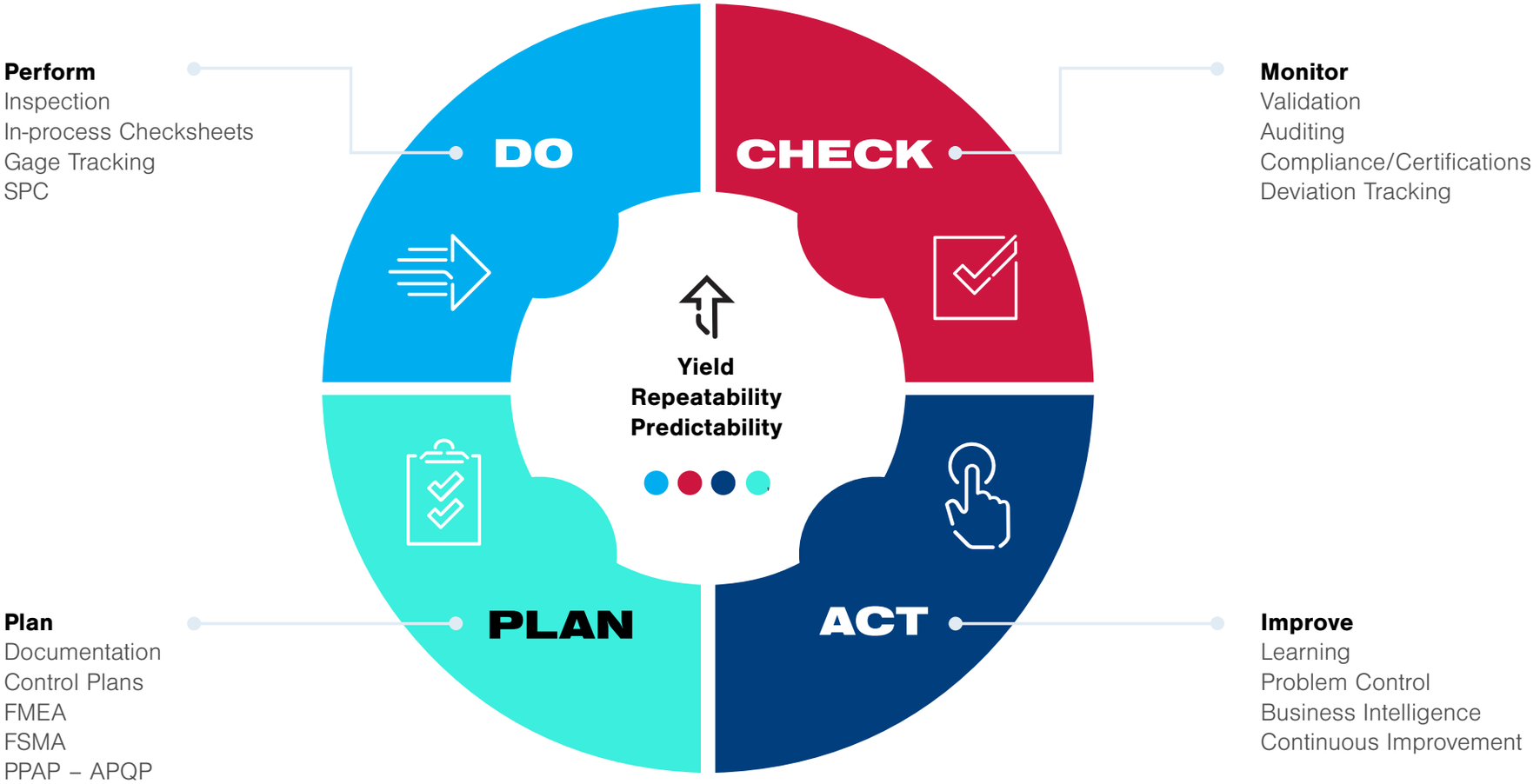
Smart manufacturing systems eliminate the errors and bias of data in compliance riders the same way they remove errors in data tracking and analysis. Change order and design change approvals can be automated to speed up the approval process. They also provide automation that automatically updates work orders, instructions, and other critical data to align each production lot with compliance requirements.

A smart manufacturing system can also be automated to send alerts and halt production for noncompliance on critical lots. It can fill, send, and manage compliance documents to the appropriate authorities to meet paperwork deadlines.

Production Optimization

Even the best process methodologies, like Lean and Six Sigma, relied upon manual data management. This practice meant that while improvements could be made, continuous measurement and analysis still needed to be corrected or rationalized. It also meant that there were levels of process improvement and optimization that human analysis couldn't reach.

Smart manufacturing software allows data-driven process optimization that removes errors, eliminates bias, and provides a depth of accuracy that uncovers hidden trends. These capabilities eliminate process veering and drive ongoing process improvements.



Perform
Inspection
In-process Checksheets
Gage Tracking
SPC

Monitor
Validation
Auditing
Compliance/Certifications
Deviation Tracking

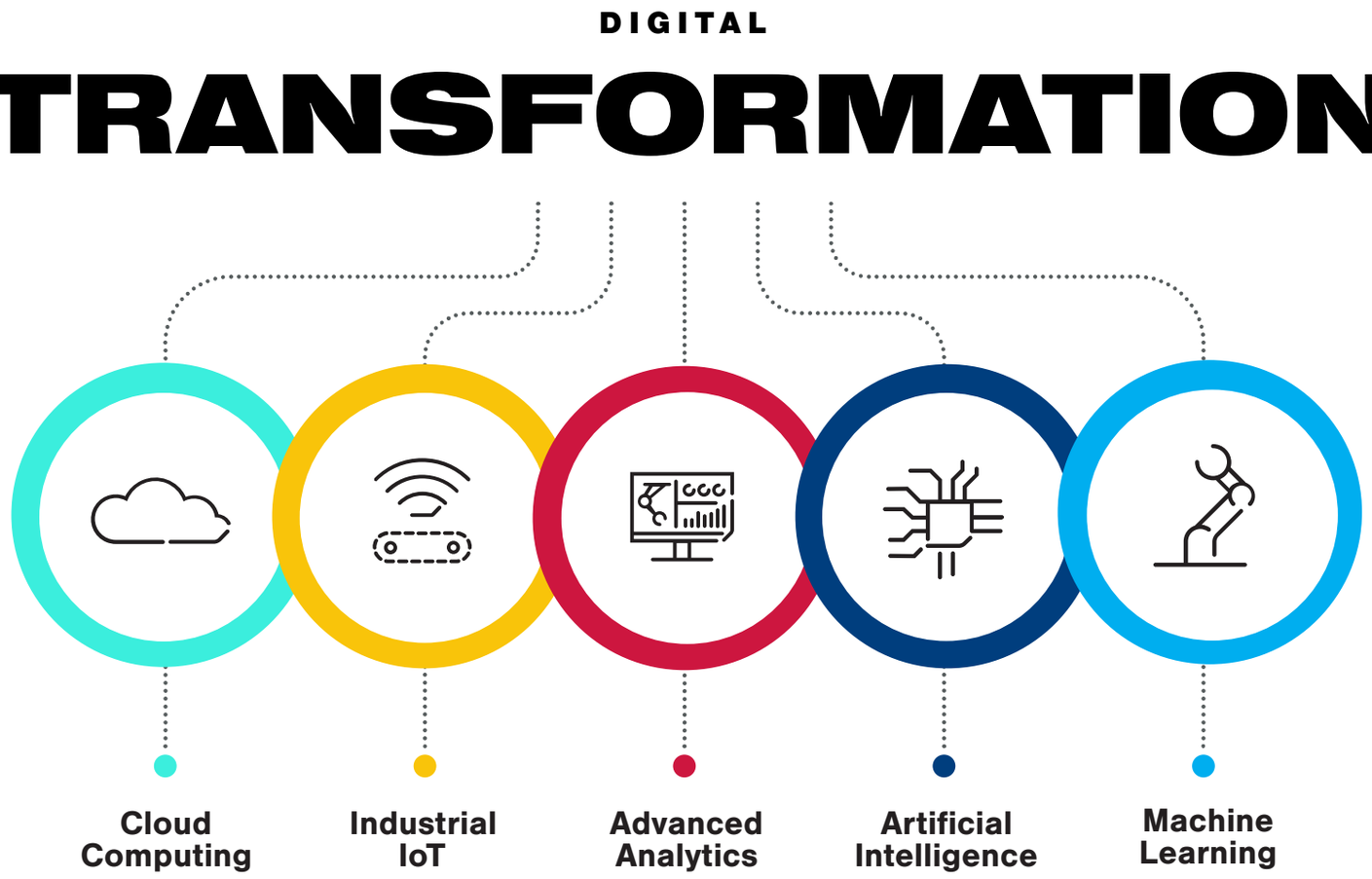
Plan
Documentation
Control Plans
FMEA
FSMA
PPAP – APQP

Improve
Learning
Problem Control
Business Intelligence
Continuous Improvement

Accelerating Your Transformation

Digital transformation uses advanced technologies like cloud computing, IIoT, advanced analytics, AI, and ML to connect to machine assets, analyze real-time data, and revolutionize business processes. It also empowers continuous improvement across manufacturing and extension to company culture and customer experience.

With optimized processes and precise data analysis, companies are better situated to address rapidly shifting markets and respond with agility to demand changes and disruption. They're also able to be more competitive and reduce operational costs.



Sustainability

Sustainability has moved to the forefront of modern manufacturing. ESG policies are now expected by boards and executives in large corporations and owners and founders of small and medium-sized enterprises (SMEs).

Companies use ESG policies to enforce responsible, ethical, and sustainable manufacturing processes and have begun to structure their operations to reflect ESG compliance across their enterprise. This requirement can challenge companies using traditional manufacturing monitoring systems and software.

Larger corporations may incur expensive upgrades to facilities and equipment, while SMEs may fear they need more resources to include ESG in their operations. Fortunately, for companies using smart manufacturing software, ESG compliance is much more attainable. It can be achieved on many fronts, from the native capabilities of the platform to driving compliance instead of inhibiting it.

Most industries already have regulatory and compliance issues, with many being extensive. The same functionality and benefits of automating processes and flagging trouble spots for regulatory compliance can be used for ESG.

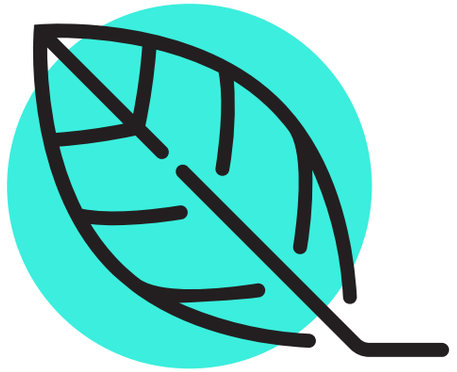
Large companies can integrate ESG policies seamlessly alongside complex regulatory policies. Already tasked with tracking expiration dates of raw materials in an industry like food and beverage, the same expiry date and traceability can be used to ensure proper disposal and raw material content.

SMEs with traditional or manual manufacturing data tracking or standalone software may be faced with forgoing ESG at the risk of their brand reputation or even fines. They may have to subcontract to third parties to program or monitor compliance policies.

Building ESG compliance into business practices has a significant ROI. According to McKinsey, top-line growth improves for ESG companies by attracting more customers with sustainable products. It also helps them realize the reduced cost of critical resources like water and energy.

ESG also improves compliance with regulatory requirements and catalyzes greater strategic freedom as companies are freed from a heightened fear of fines and penalties. And it helps with workforce recruitment, motivating employees, and creating a positive environment where people want to work.

Smart manufacturing solutions help manage risk by providing automation that gives companies an advantage in cost, compliance, and risk management compared to those still using manual production systems or standalone software.



What's next?

The right software brings your traditionally siloed and disparate departments together to unleash the power of cloud-based infrastructure so you can manage your business with real-time insights based on what is happening now. If that sounds more like your ideal state than your current state, then it's time to move your smart manufacturing journey forward.

Continue your smart manufacturing journey at plex.com

Plex, by Rockwell Automation, is a leader in cloud-delivered smart manufacturing solutions, empowering the world's manufacturers to make awesome products. Our platform gives manufacturers the ability to connect, automate, track, and analyze every aspect of their business to drive transformation. The Plex Smart Manufacturing Platform™ includes solutions for manufacturing execution (MES), ERP, quality, supply chain planning and management, asset performance management, production monitoring, process automation and analytics to connect people, systems, machines and supply chains, enabling them to lead with precision, efficiency and agility.

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