

EBOOK

FACTORY OF THE FUTURE IS NOW: A Step-by-Step Approach to Digital Transformation Through IIOT Smart Factory Technology

💮 shoplogix

Contents

1. Introduction

2. Define Vision—Turning Goals into Actions

Step 1: Define Why Digital Transformation Matters to Your Operations Step 2: Assess Digital Maturity

5. Map out Transformation Step 3: Understand Lean Manufacturing Philosophy Step 4: Establish Lean Benchmarks

9. Find the Right Smart Factory Technology Step 5: Understand Smart Factory Platforms Step 6: Choose the Right Vendor

13. Digital Shop Floor Best Practices

Step 7: Implement Real-World Best Practices Step 8: Smart Manufacturing Metrics

17. Define Long-Term Success

Step 9: Establish Realistic OutlookStep 10: Define ROIStep 11: Implement Change Management

22. Conclusion

Introduction

Is your manufacturing operation using yesterday's paradigms to solve today's problems?

The market is evolving and new players are emerging; these competitors are delivering better products at a faster rate and your operations are failing to keep up. The outdated and disconnected technology in your facilities holds you back from innovating and negatively affect downtime and production losses. Questions circle boardrooms and the shop floor. How do we meet revenue targets and increase production baseline? How do we reskill/upskill our workforce and drive engagement? How do we stay ahead of the technology curve to remain competitive?

The answer? Harness the power of digital transformation and become a champion of the Factory of the Future (FoF) through smart factory technology.

A Deloitte Industry 4.0 survey shows that 94% of executives report digital transformation as their organization's top strategic initiative. We know digital transformation works and we've seen its impact in other industries from finance, agriculture, energy, and healthcare. These early adopters of i4.0 digital transformation technologies have become leaders in production and service innovation and in turn, the world now has higher standards of quality and services. Today's manufacturers need every competitive advantage they can get to future-proof operations and not get left behind.

True digital transformation connects to assets, data, people and processes. Your machines have the capability to generate hundreds of data points every millisecond, your employees generate performance data, your processes can be tracked and this collective data can be harnessed through IIoT powered, connected flexible systems to capture real-time information to make smart production decisions. It's about finding the right smart factory technology to utilize your data to understand your production story of what occurred in the past, what is currently occurring, and what is possible in the future.

In this eBook, you will a gain step-bystep process created by smart factory experts to understand where you are in this transition, and jumpstart your own digital transformation journey. How will the adoption of an IIoT powered smart factory solution impact your operations and your employees? Find out.

A recent study by research firm McKinsey & Company suggests that established companies are leaving as much as US\$2 trillion on the table in total return to shareholders because of missed opportunities in digital transformation.





The Machine Level Whiteboard screen displays production count charts, goal and cycle gauges, downtime reasons, and comments at the Machine Level.

DEFINE VISION TURNING GOALS INTO ACTIONS

The overall vision your operations have of digital transformation through IIoT smart factory software adoption paints a picture and an understanding of what the operations' future state will become. "Globally, digital transformation in manufacturing operations are moving forward as customer demand increases—which means manufacturers need to invest in gaining the edge, securing growth, improving products, and winning in their markets."

Nick Marchioli – VP Global Sales, Shoplogix

STEP 1: Define Why Digital Transformation Matters to Your Operations

First, let's review what digital transformation means. The Institute for Digital Transformation defines it as,

"The integration of digital technologies into a business resulting in the reshaping of an organization that reorients it around the customer experience, business value and constant change."

Some of the common visions that manufacturing operations have of digital transformation with smart factory technology include:

- · Make smarter decisions based on real-time production data.
- \cdot Gain an understanding of OEE and machine downtime.
- · Standardize processes and metrics to measure.
- · Improve product quality and reduce waste/scrap to become more sustainable.
- · Have a centralized system with integrated ERP data.
- · Reduce high labor costs.
- · Reduce time to market.
- · Achieve a continuous improvement culture.
- · Remove departmental silos and connect data, people, assets, and processes.
- · Create a seamless customer experience.
- · Future-proofing operations to withstand unexpected events.

Vision of Smart Factory

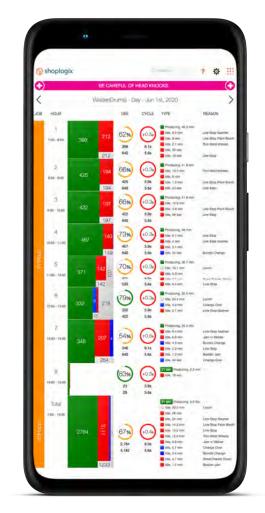


STEP 2: Assess Digital Maturity— Identifying Plant Personality

You can't know where you are going, without knowing where you are.

In order to achieve your operation's digital transformation visions, it's important

to understand the level of digital maturity in your operations, identify where your technology and processes fall under the Plant's Personality chart on the next page and gain an understanding of what is missing in your current technology ecosystem to map out your digital transformation journey.



Automatic production data capture (accurate, reliable and insightful information recorded automatically & in real-time based on machine states).



Global spending on IIoT Platforms for Manufacturing is predicted to grow from \$1.67B in 2018 to \$12.44B in 2024, attaining a 40% compound annual growth rate (CAGER) in seven years.



On average, operations that are more digitally advanced dedicate 65% of their global factory budget to smart factory initiatives.

WHAT'S YOUR PLANT'S PERSONALITY?

Whiteboards & Spreadsheets

Your operations rely on spreadsheets, manual whiteboards, paper schedules and lack automation. Operational data is collected manually and often inaccurate or unavailable.

Solo Systems

Your operations have one or more systems in place for digitization however they are standalone systems that lack bi-directional data communication and information is not centralized.

Digital Novice

Your operations have some automation in place and is showing interest in full digital transformation. You are beginning to explore the benefits of connected, flexible IIoT digital solutions.

Data Explorer

Your operations have implemented some digital solutions and want to drill into more meaningful real-time data to make smarter decisions and engage employees.

Digital Trailblazer

Your plant is digitally mature with connected and integrated IIoT solutions to manage production processes. You are knowledgeable of thebenefits of scalability and enterprise-wide adoption of new smart factory technology.

Common gaps in technology include: lack of connection to visualization on the shop floor, lack integration with existing technologies (ERPs, MRPs, shop floor data tools), lack of skilled labor and IT personnel to manage technology, lack of internet connectivity/wifi, lack of automated reporting.

According to the Manufacturing Advisory Service, lean manufacturing can lead to:



MAP OUT TRANSFORMATION ESTABLISHING LEAN BENCHMARKS

Now that you have correctly identified which stage of digital maturity your plant falls under, and determined that the competitive advantage of new technology is required, the next step is to establish lean benchmarks and understand the interplay of lean and smart factory software.



+33% Stock Turn



+25% Productivity



-26% Scrap



-33% Space

STEP 3: Understand Lean Manufacturing Philosophy

Hundreds of manufacturers embrace the principles of lean manufacturing to reach their benchmarks and full potential. The interconnectedness of lean objectives and processes and the right smart factory technology is a powerful relationship that can elevate operational performance, continuous improvement, and company culture in a short period of time.

What is lean manufacturing?

Essentially, lean manufacturing, also known as lean production, is a philosophy based around the elimination of waste within a system. It was first pioneered by the Toyota Production System (TPS) in the 1990s and has become widely used throughout the manufacturing industry.

The Power of Lean and the Toyota Production System





IN ORDER TO BECOME A LEAN FORWARD OPERATION, YOU MUST:



Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.



Create a continuous process flow to bring problems to the surface.



Use 'pull' systems to avoid overproduction.



Level out the workload (work like the tortoise, not the hare).



Build a culture of stopping to fix problems, to get quality right the first time.



Standardized tasks and processes are the foundation for continuous improvement and employee empowerment.



Use visual controls so no problems are hidden.



Use only reliable, thoroughly tested technology that serves your people and process.



Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.



Develop exceptional people and teams who follow your company's philosophy.



Respect your extended network of partners and suppliers by challenging them and helping them improve.



Go and see for yourself to thoroughly understand the situation.



Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.



Become a learning organization through relentless reflection and continuous improvement.

Today's ever-complex manufacturing processes cannot be optimized just by manual lean management reliant on employee documentation and data gathering. Factories need to transition into digitized, smart factories aka Factories of the Future (FoF) through smart factory technology adoption to accelerate, sustain, and improve lean initiatives and attain maximum ROI.



STEP 4: Establish Lean Benchmarks

If benchmarking is done correctly, it can be a tremendous source of new ideas, a confirmation of current practices, and an exciting catalyst to take performance to much higher levels.

Benchmarking is a structured way to compare products, strategies, programs, and processes understanding how other manufacturers perform their processes to achieve targeted performance.

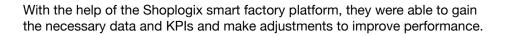
Setting the right benchmarks for your lean objectives and utilizing the right data through smart factory technology enables operations to determine which processes need improving, the idea is to convert these insights into action to improve the bottom line.

Multinational food manufacturing company and Shoplogix customer, had a long term digital transformation execution strategy of 5+ years.

They established lean benchmarks that focused on gathering machine truth, accurate data collection, improved processes, and engaging employees which included:

- · Improving Yield & Efficiency
- · Increasing throughput
- Accelerating KWS adoption
- Driving employee engagement and action
- · Unlocking value from data
- · Flexible collection methods

- Advanced visualizations
- analytics and Al
- \cdot Enabling adoption
- Standardizing reporting
 Real-time analytics
- · Accelerating decisions



The Shoplogix smart factory platform automates collection such as scrap reasons, temperatures, downtime and more from machines.
Easier to find route causes and potential to improve— no second-hand information.
Connect data to employees
Engagement on lean initiatives
Reports and dashboards used in daily stand up meetings
Grow leaders and develop exceptional workers—drive culture change

Engage

Employees

Measure ROI

Collect Routine

Data from Assets

Adjust

- Take a data-driven, analytic approach to problem-solving
- · Ability to adjust actions that are not working as expected

 Dashboards with visualized shop floor data provide quick overviews of what's working and what is not

 Ability to measure engagement with and how they are interacting with data

A key characteristic of the lean journey is that you never stop learning. With the right smart factory technology, it can become a continuous improvement cycle that will enable operations to climb the ladder of manufacturing excellence.

FIND THE RIGHT SMART FACTORY TECHNOLOGY

Now that you have an understanding of lean manufacturing and benchmarking, the next step is to understand the type of smart factory technology that will digitize operations and accelerate lean initiatives. "The smart factory represents a leap forward from more traditional automation to a fully connected and flexible system – one that can use a constant stream of data from connected operations and production systems to learn and adapt to new demands."

Smart Factory Manufacturing Insights

STEP 5: Understand Smart Factory Platforms

Smart factory, industrial internet of things (IIoT), i4.0, big data, industrial connectivity, industrial transformation (IX)—with a sea of new terminology, you can quickly drown in information if you're not sure what the best fit is for your operations. In this chapter, learn how an IIoT smart factory system can digitize your shop floor.

As we've covered, for a factory to become truly digitized, maximize lean practices, and attain efficiency gains, it needs a smart factory platform that can deliver on four pillars: assets, data, people, processes.

A connected factory facilitated with smart factory software can be used to make better decisions on lean production. Essentially, a smart factory connects all the machines, existing systems such as ERPs and MES (even legacy systems), automates production monitoring, visualizes the performance of assets and people, creates analytics, and drives predictive and smart decision making.

"Smart factory platforms are capable of connecting the dots. It delivers the right information to the right people at the right time. A true smart factory system should be simple, easy to adopt and improve the flow of information out from the pulse of machines to everyone in your factory"

Manny Bonilla,
 VP Product Strategy, Shoplogix



ITIF research reports, IIoT applications for

monitoring machine utilization can increase manufacturing productivity by 10 to 25% and produce up to \$1.8 trillion in global economic value by 2025.

Let's take a look at how smart factory technology supports lean principles



%

DATA COLLECTION

- · Helps to make long-term, smart decisions
- Standardizes routine data collection automatically and KPI measurements
- · Provides visual controls so no problem is hidden

VISUAL MANAGEMENT

- Engage operators by defining targets and standards
- Empower operators with easy access to their performance data
- · Uses visual controls so no problems are hidden

- · Drive engagement with daily reviews
- · Measure countermeasure effectiveness
- Review improvement activities and sustain the gains



MEASURE IMPROVEMENT

- · Bring value-creating information to the entire enterprise
- · Promote benchmarking and sharing
- · Identify where resources are required

Learn more about on how lean strategy and a smart factory work together.



The Area Level Whiteboard screen displays current shift information for all machines within the selected area. The display includes production count charts, goal and cycle gauges, downtime reasons, and comments at the Area level.

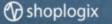
STEP 6: Choose the Right Vendor

Searching for new manufacturing technology involves a lot of resource time and money. It's important to follow software search best practices to ensure that you don't add unnecessary time to the project.

Building in-house software can seem like the best decision for most manufacturers who become overwhelmed with the search process. In reality, most software build projects cost more than purchasing an out-of-box solution from a seasoned provider.

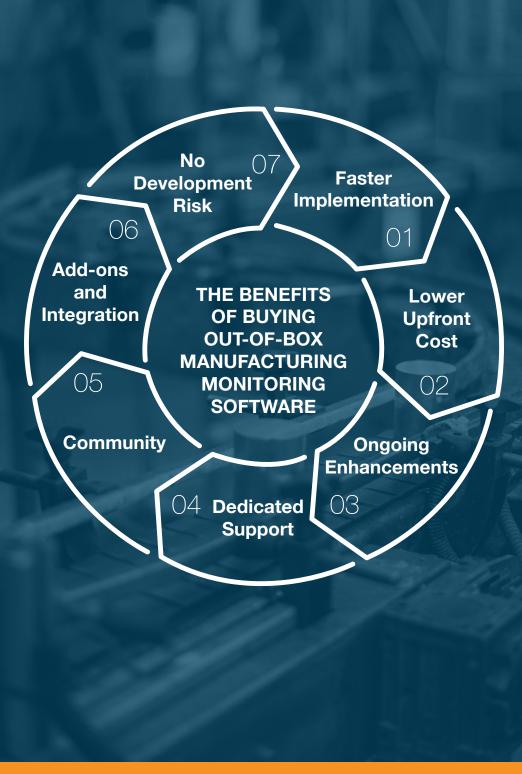
With over 20 years of experience in the manufacturing industry, our smart factory experts have guided countless manufacturers through the search process. To help software searchers, our experts created a comprehensive smart factory software search requirements checklist.

Download to jumpstart your search!



A CHECKLIST FOR MANUFACTURERS SEARCHING FOR THE RIGHT SMART FACTORY SOFTWARE SOLUTION.

DOWNLOAD NOW



DIGITAL SHOP FLOOR BEST PRACTICES

A major part of mapping out your digital transformation is to research how others in your space have adopted digital technologies to understand the opportunities and challenges that happen in real-world shop floors. "A connected smart factory brings the shop floor closer to the people, especially people that are currently distanced from the process. It does not conflict with lean initiatives, it supports them by providing real-time data at your fingertips, supplements them by using data to uncover new opportunities, accelerates them by speeding up data collection, and helps to sustain results through visualization and democratizing gains."

Martin Boersema-Smart Factory Lean Expert, Shoplogix

STEP 7: Implement Real-World Best Practices

With hundreds of implementations and establishing ROI based smart factory capabilities and processes for manufacturers under our belt, we have collected actionable best practices and lessons learned that have proven to drive results.

One of the key learnings of digital transformation with smart factory technology adoption is to integrate technology with data, assets, people, and processes to achieve fast ROI, sustainable results and adopt continuous improvement culture.

Engaging people is one of the most important characteristics of a smart factory!

Maintenance Team

Will be alerted on time for issues, and have access to downtime and losses.

CI Team

Gain visibility into bottlenecks to identify areas of improvement.

Quality Team

Input scrap and have visibility into alerts that are happening on the line to take fast action.

Scheduling Team

Know when production runs are going and if they are going to hit due dates.

Material Handlers

Alerted on consumption to bring product to line and prepare for upcoming changeovers.

Management

Easily access dashboard views to monitor production and help teams to work together.

Executives

Drive standardization and scale adoption enterprise-wide.

OTHER BEST PRACTICES INCLUDE:



• Ensuring KPIs are a part of your daily procedures in daily shift meetings



 Integrating new technologies with existing ERPs and MES systems



· Standardizing data collection



Establishing smart manufacturing metrics that support lean benchmarks.



• Taking a thin layer adoption (more on this in the next chapter)



Conducting post-deployment initiatives, continuous improvement efforts

Customer Success Story

ENTERPRISE INDUSTRIAL PACKAGING ORGANIZATION

The below real-world example of a leading European packaging company and Shoplogix customer, drills into more specific best practices and lessons learned in their operations. The goal was to improve plant performance to achieve manufacturing cost reductions through efficiency. Based on success deploy across 20 European plants.



RESULTS

By reducing the Avg. Set up waste per job, we are able to save circa €800,000 per annum based on an Avg. of 17 job changes per day across 5 presses.

Films Division CPS Lead

OEE 20.75% 9% improvement



Up from 4,859 (2018 baseline)



Run Speed 201^{mpm} Up from 174^{mpm} 16% improvement



Avg. Setup waste/job 10% Down from 1531 to 1371

Read the Full Case Study

() shoplogix

"The true power of meaningful metrics in smart manufacturing is providing everyone - from shop floor to top floor, with visibility into how their daily contributions to planning, producing, optimizing, and servicing products matter. Reporting and analytics is the cornerstone that keeps smart factories hyper-focused on meeting changing consumer needs and empowering production teams to continually keep striving to improve shop floor process performance, product quality, and customer satisfaction."—Manny Bonilla, VP Product Strategy, Shoplogix

STEP 8: Smart Manufacturing Metrics

Turning data into meaningful insights is not an easy undertaking especially when dealing with high volumes of information. Focus on these five most important smart manufacturing metrics that support lean initiatives.

ADOPTION

i4.0 technology must be adopted by employees to attain ROI. Measure an overall adoption score of individual tasks and interactions with new software at a machine, plant or multiple plant.

Keys to monitor include:

- · Machine downtime documentation
- · Comments provided
- · Scrap recorded

Learn More

ACCOUNTABILITY

Accountability closes the loop on issue resolution. To assign actions with resolution dates enables manufacturers with the ability to measure the how effective a plant is on resolving problems.

PERFORMANCE

Machine /Job run speed targets are important to measure potential throughput. Inaccurate rates can mask issues so it's vital to monitor OEE with a true smart factory platform.

Metrics to track include:

- · Machine truth reporting in real-time
- · Root downtime cause analytics
- · Employee performance
- · Process improvements

OEE LOSS BY ROLE

Supports accountability to drive adoption and CI improvements.

Roles to track include:

- **Operators:** Are they arriving late, leaving early, extending break time, or having unexplained idle time?
- **Maintenance:** How long does it take for them to arrive on the line and complete repairs following an alert?
- **Continuous improvement:** This team should take ownership of micro-stoppages, line bottlenecks, and mechanical process design flaws.
- **Material handling:** Are they taking responsibility for reducing changeovers, material shortages, and material flow optimization?
- **Changeover teams:** To gain deeper insight into changeover losses, split changeovers into multiple stages.
- · Quality: Focus on scrap rework and quality downtimes.

OEE VS OEEc

OEE measures performance during scheduled hours and OEEc measures performance 24x7. With OEEc, the focus stays on improving the metric—not just on establishing it. By removing the uncertainty of scheduled time, OEEc is a more reliable metric for performance trajectory and understanding the why behind it.

DEFINE LONG-TERM SUCCESS

It's important to create a realistic outlook on digital transformation and expected ROI. The key is to approach the transformation in thin layers to use only the data that is required to avoid getting lost in an influx of information. It's also critical to define the types of ROI to see an accurate picture of software benefits. "As organizations embark on this journey they should start in an area that has connectivity to data, make sure the process becomes integrated into existing internal systems so it remains a critical path."

Nick Marchioli–VP Global Sales, Shoplogix

STEP 9: Establish Realistic Outlook

Many manufacturers want to scale the technology enterprise-wide right away. In some cases this makes sense. For example, a leading European packaging company and Shoplogix customer, had a goal of launching digital transformation initiatives and the Shoplogix smart factory platform across 40 enterprise plants.

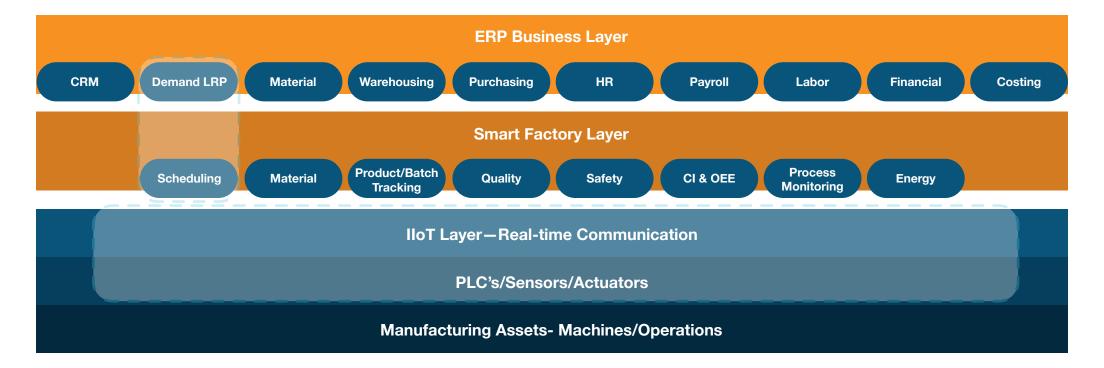
Typically manufacturers start with a thin layer approach to connectivity to first determine ROI before scaling. This also allows for greater budget control.

For example, Shoplogix worked with a leading food and beverage manufacturer who evaluated the costs of a full adoption vs. thin layer and approached the implementation of smart factory software in steps rather than full enterprise adoption.

They focused on customer satisfaction and determined that a key metric to track for this is order fill rates. To improve order fill rates, manufacturers need to evaluate scheduling processes so it's important to focus on this initiative first.

They connected only to the data points needed such as work order information, job attribute, part counts, job status updates with simple metrics to measure the performance of order fill rates.

This thin layer approach ensures ROI is achieved and time to value is short and provides enterprises the ability to scale.



STEP 10: Define ROI

When considering investing in an IIoT platform such as a smart factory software solution, one of the most important factors that organizations tend to consider is the level of profitability that the tool can offer.

There are several different types of ROI to consider:

HARD RETURNS

- · Cloud-based solution.
- · Increase in productivity.
- Increase in OEE—for example, average improvement to expect for OEE is 9-13%.
- \cdot Reduce waste and loss of materials.
- · Improved and increased quality.
- New technology should simplify information and reporting.
- ERP connectivity and integration with other systems helps workflow sales orders can flow through ERP.
- · Facilitate a paperless system.
- · Connects all siloed departments with real-time visibility.

SOFT RETURNS

- · Wiser, quicker decision making.
- · Optimization leads to more innovation.
- · Standardization of processes across the enterprise.

Customer Success Story

GLOBAL FOOD MANUFACTURER

Goals: Establish smart factory of the future empowering plant floor staff to act in real-time. Improving plant efficiency and reducing waste in a 16 month timeframe in 37 plants.

SMART FACTORY REQUIREMENTS:

- · PLC connection and/or physical sensors
- · Visual boards integrating data from multiple systems for operator consumption
- · Visual TV infrastructure
- \cdot Work order and quality system integration

ROI REALIZED:



WHAT OBSTACLES CAN KEEP YOU FROM ACHIEVING ROI:

	Skilled Labor		
		ROI Estimator Vendor A Shoplogix	
	Culture & Adoption	Estimated investment/year:	Shoplogix Estimated investment/year:
		Scheduled weekly hours:	Scheduled weekly hours:
	Data Integration, IT & Connectivity	Burden Rate/hour:	Burden Rate/hour:
		Number of machines:	Number of machines:
	Capital Investment	Target improvement (%):	Target improvement (%):
		Estimated savings/month:	Estimated savings/month:
	Executive Support	Pay back time in months:	Pay back time in months:
f the operation is continually increasing capital investment without seeing tangible ROI, it may lose executive support, putting the entire project at risk. Get ahead of hese potential issues before they become real problems.		<u> </u>	

CALCULATE YOUR ROI:

will pay for itself!

Use the below ROI calculator to see how quickly your smart factory investment

STEP 11: Implement Change Management

Change Management is a structured process that gets the right people involved at the right time to ensures everyone knows how and when to perform the new procedure and is committed to using the new process.

The most important strategies for effective technology adoption is communication. Good communication is not just sending out a few sporadic emails a few days before the new technology is implemented, it, an enterprise-wide solid communication plan needs to be present months before the adoption process.

A fine-tuned change management framework with clear-defined stages is necessary for the effectiveness and efficiency of smart factory adoption. CEB research discovered that 66% of change success factors are related to talent. Focus on your people to greatly increase your chances of smart factory adoption success.



The OEE Waterfall displays loss categories and breaks down all categories of production that make up a specific machine, area, or line. The display breaks down into availability, performance, and quality.

Communication Strategies

 Hosting Town Hall meetings months in advance of implementation to educate employees on changes that are coming down the road to their individual roles.

 Announce the changes that will be taking place at weekly team meetings. Tell your employees why you're introducing the new software, and how it's going to make their jobs easier.

• Create FAQ sheets or one-pagers and send them to your employees. These strategies will help employees feel like a part of the adoption process and provide opportunities to address any feedback and concerns that may arise.

Sufficient Amount of Resources

• It's important to have internal "champions" like lean, six sigma, people who will actually use data to set the tone for the rest of the organization.

• Have the right people to implement change management

Post-deployment Activities

- Continuous improvement initiatives should be present long after implementation to measure results such as employee adoption score and to evaluate if you are still achieving ROI.
- Continuous training is also a must to keep employees engaged with the system. Consider monthly, yearly refresher sessions for employees to relearn best practices and discover new opportunities within the system.

Executive Sponsorship

- Establish a steering committee
- \cdot Execs need to be able to use the data
- Executive dashboards need to be integrated into management procedures

Employee Resistance

- Frequent, transparent communication about coming changes and business rationale.
- IT resistance—may want to build everything themselves. Educate them on how smart factory implementation means less time on maintenance and more capacity to focus on other innovative projects.
- Present the new system as a tool to empower employees and help them feel more fulfilled in their roles.

Change Management Structure

• Try coaching instead, asking more (open-ended) questions instead of forcing change. It's through the reflection in the discussion that you're more likely to persuade the employee to try the desired behavior.

Conclusion

By now, you should understand how an IIoT smart factory drives digital transformation can deliver real value to your operations and your customers.

Forming a step-by-step lean-based strategy and thin layer implementation approach will increase the chance of digital transformation success. Finding the right smart factory technology partner is also just as important—a partner that will help your operations become more consumer-focused through improved processes as quickly as possible.

Shoplogix helps manufacturers realize their digital transformation vision. With almost 20 years of experience helping manufacturers in sectors such as Food and Beverage, CPG, Industrial Packaging, Steel, Automotive, and more, we offer the right experience, leading IIoT technology, innovation, and dedicated people to improve your bottom line.

Ready to start your digital transformation journey with Shoplogix?









Let Shoplogix help achieve your Smart Factory vision. Contact us today.

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About Shoplogix

Shoplogix is re-defining the manufacturing industry by making the Smart Factory platform the cornerstone of digital production performance transformation. By empowering manufacturers to visualize, integrate, and act on production performance in real-time, Shoplogix helps to uncover hidden shop floor potential and drive rapid time to value.