

The Digital Transformation Manual

The Practical Path to Smart Manufacturing

EBOOK

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Introduction

As manufacturing enters the **Fourth Industrial Revolution**, momentous change is transforming the sector at unprecedented speeds. Data-driven Industry 4.0 technologies, such as machine learning and artificial intelligence (AI), already enable manufacturers to make high-quality products faster and at lower costs. Whoever fails to embrace this change and advance towards more intelligent, data-led manufacturing risks becoming obsolete.

Why? No business has ever survived a manufacturing revolution without adopting new, emerging technology. Manufacturers no longer run on steam engines and there isn't a factory without computers and electronics controlling integral parts of their systems.

In this regard, the digital manufacturing revolution will be no different. However, as with any revolution, there's a lot of confusion and a need to separate myths from reality.

In this Digital Transformation Manual, we offer practical recommendations to benchmark your organization on the digital transformation curve and actionable steps to kickstart your journey and progress. The sooner you start, the sooner you can transform your factory to be more competitive, efficient and profitable.



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*Willem
Sundblad*

In this eBook, we look at:



Master Digital
Transformation



Excite Stakeholders



Select The Right
Technology & Partner



Evolve Into A
Smart Factory

Background



What Does Digital Transformation Mean In Manufacturing?

Digital transformation is a major focus for manufacturing executives and operational technology (OT) decision-makers. In fact, it's attracting massive investment, with **IDC predicting spending on digital transformation will reach nearly \$2 trillion in 2022.**

But what's behind the drive? The pressure to innovate, cut costs and drive efficiencies. These present a huge challenge to enterprises, while technological disruption continues to force decision-makers to re-evaluate manufacturing and logistics processes.

Industry 4.0, or the Industrial Internet of Things (IIoT), has the power to drive significant and quantifiable change in manufacturing.

Background

PRODUCTION LEVEL BENEFITS OF IIOT



Fewer Machine Failures



Reduced Scrap



Increased Transparency



Reduced Downtime Issues



Improved Throughput

A best-of-breed Industry 4.0 platform provides a crucial single source of truth for manufacturing operations, so critical decisions are based on a unified dataset. Manufacturers don't have to rely on disparate systems or manual data collection; now they can enjoy a holistic view of their processes.

Digital transformation also drives positive cultural shifts across manufacturing organizations, changing the way manufacturing staff work, collaborate and serve customers, ultimately creating stronger relationships.

The business case for Industry 4.0 is recognized by manufacturers of all sizes across the world. Digital transformation towards creating a “smart factory” often starts with a single test & learn project or ‘pilot’ that works as a proof of concept and leads to further, incremental development.

Let's examine the **7 steps** to master digital transformation and become a smart factory.

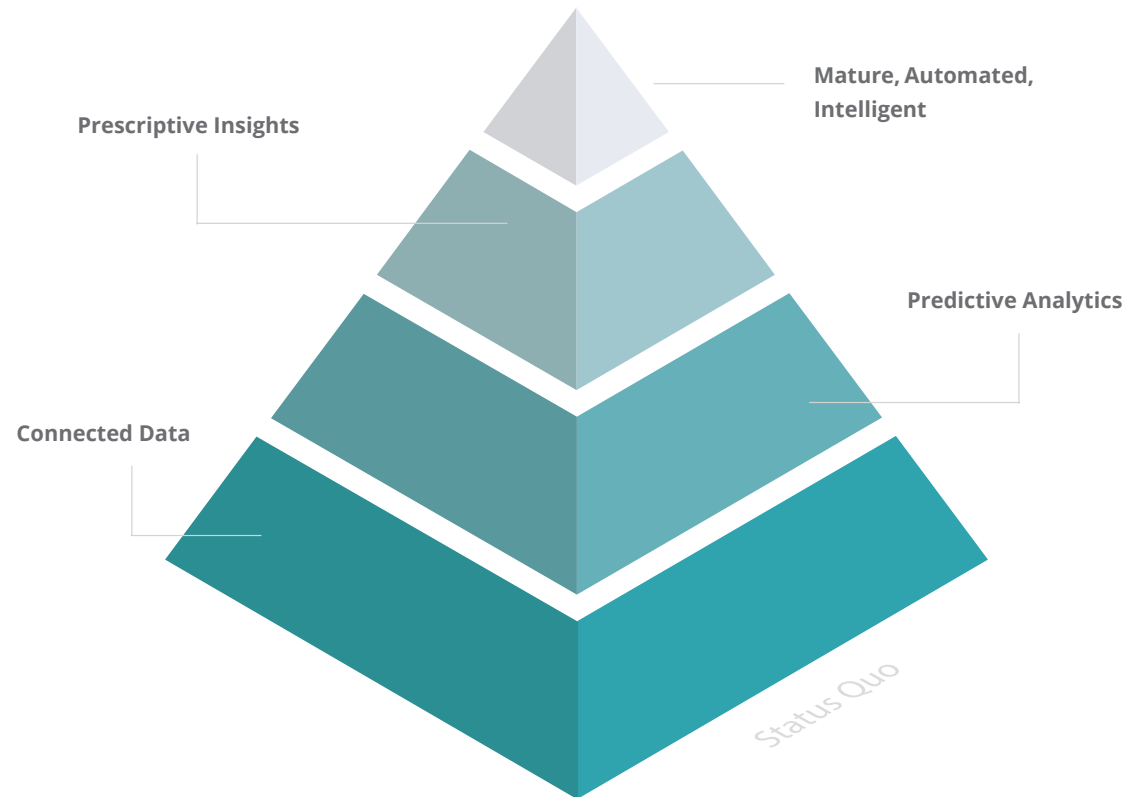
Step 1: Track Your Digital Transformation Journey

Manufacturers are currently at very different stages of digital transformation. So far, the competitive pressure to evolve practices has not been as intense as other sectors, such as retail, but we expect this to change rapidly as the key drivers are the same: the need to operate more efficiently, cut waste and meet ever-changing customer demands.

Let's unpack the **Four Levels** that lead to the smart factory.

Where is your organization on this spectrum?

THE FOUR ANALYTIC CAPABILITIES



Step 1: Track Your Digital Transformation Journey

LEVEL 1

Connected Data



The first step is to connect different sensors, machines and systems on the factory floor. Data can be stored in different databases or servers across cloud or edge technologies but have a centralized access point, such as an OPC UA server. Centralized access enables a single source of truth that continuously gathers and tracks production data.

A connected layer allows for real-time monitoring, enables diagnostic analytics, creates easy data access and allows the factory to quickly investigate any problems. Engineers solve challenges quickly because they rapidly locate information to conduct analyses. They no longer move around the factory from one source to another, trying to work out what went wrong.



Engineers investigating quality failures collect data from devices across the factory floor.



This information is then combined and compared to data from the quality management lab, assessing product test performances.



Information is further compiled from the order system about what customers are buying.

With easy data access, engineers perform diagnostic analysis and drill down into different granularities found throughout the production process. Instead of spending time collecting and sorting multiple data sources, they can focus addressing high-value issues such as process optimization, waste reduction or quality improvements.

Step 1: Track Your Digital Transformation Journey

LEVEL 2

Predictive Analytics



At this level, you are able to begin proactively addressing problems that will occur in the future. Many of the machines on the factory floor operate under extreme stress. High temperatures and pressure result in the necessary replacement of parts. With intervention, the impact of these breakdowns can be mitigated, saving the thousands of dollars it would have cost for every minute of that lost production and downtime.

Level two relies on the strong database architecture that was built in level one. Why? Because the amount of data available dictates how precise the machine learning model can be when creating the solution. In order to predict a quality failure, data from 10 different instances of that exact quality failure are required. It is critical to combine offline quality data, inline process metrics, machine conditions and other variables in order to build predictive analytics. A strong, scalable database architecture enables the factory to get those proactive and predictive gains.

BENEFITS OF PREDICTIVE ANALYTICS



Data is translated and data and patterns are identified that previously led to quality failures, downtime or other loss events



Alerts and alarms notify teams when factory conditions indicate problems, like motors operating at overly high temperatures



Teams can take corrective action and avoid failure

Step 1: Track Your Digital Transformation Journey

LEVEL 3

Prescriptive Insights



The third level can be performed in conjunction with predictive analytics and takes production optimization one step further. Instead of predicting when failures might occur, prescriptive analytics provide automated insights that allow engineers to replicate their most profitable runs more consistently.

This level not only translates the best runs for the line, but also converts years of best practices from seasoned veterans into standard processes. The database of “tribal knowledge” can then be utilized by new operators, which mitigates the cost of training and development. This also prevents interruption of optimal production, as new hires are able to rely on these standardized best practices.

BENEFITS OF PRESCRIPTIVE INSIGHTS



Analyzes both live and historical production data



Isolates the variables, relationships, and production conditions that contribute to your most efficient and least efficient runs



Translates into recommendations that engineers use to make process changes such as increasing throughput without sacrificing quality

Step 1: Track Your Digital Transformation Journey

LEVEL 4

Mature, Automated, Intelligent



The final level is fully automated, closed-loop control. Recommendations are automatically pushed to your machines without the intervention of engineers or operators. Using the information in its database to identify where efficiencies can be made, the system can generate new settings and send instructions to a machine on the factory floor. In other words, it can use machine learning and AI to implement changes and carry out production.

Achieving level four requires a large amount of data, so there is enough information for the system to understand impacts of production changes. The time needed to move from level three to level four depends on how long it takes to gather necessary datasets.

OPERATING AT THIS LEVEL, YOUR SYSTEM CAN:



Identify and execute changes on its own



Identify new ways to improve a product



Create new settings and implement them



Anticipate problems and fix them



Deploy data to speed up the manufacturing process



Optimize all processes

REMINDER

Transition takes time, and even with a system working hard to collect data and recommend changes, it takes a while before manufacturers are comfortable making the entire end-to-end journey autonomous.

Step 2: Make The Business Case For Digital Transformation



One of the big challenges for organizations is **lack of buy-in from senior management**.

Want to excite stakeholders? Demonstrate how digital transformation can achieve time-to-value and speed of iteration.

There is no perfect digitization project, but easy-to-deploy analytics reduce the risk of transformation and find value case-by-case along the way. Once you prove the high potential and limited risk, you'll build a strong case for change.

In our experience, it's not just about the economic case, there are also employee benefits – from more efficient staff operations to better recruitment for the organization. Smart manufacturing is also instrumental in reducing waste and identifying areas where organizations can become more sustainable, a core responsibility of any 21st-century manufacturer.

Step 2: Make The Business Case For Digital Transformation

Perfect Production

Digital transformation technologies are designed to address the cost of poor quality and downtime by increasing efficiency. The total costs of poor quality can be extensive. Repair, rework, scrap, service calls, warranty claims and write-offs from obsolete finished goods can make a significant negative impact on total revenue.



Poor quality typically costs between 10% and 20% for most manufacturing companies, but can be as high as 30%.

Agility And Sustainability

In an era when personalization is increasingly paramount, Industry 4.0 technologies enable manufacturers to be more agile and responsive to changing customer and market demands.

For example, in a smart factory, the number of products manufactured could be linked to your customers' order system. Working in this data-led way, factories are able to create an optimum number of products, rather than over-producing or under-producing. This cuts out unnecessary costs around wastage, missed sales opportunities and storage of over-produced products.

Efficient processes help manufacturers:

- ✓ Become more sustainable
- ✓ Reduce waste, lower emissions, save energy and recycle
- ✓ Become more appealing to today's customer
- ✓ Save money

Step 2: Make The Business Case For Digital Transformation



People

Industry 4.0 technologies impact much more than data and analytics; they drive a smart manufacturer's entire working culture and solve a variety of different recruitment issues.

Attracting new engineering talent can be challenging for manufacturers.

Young, tech-savvy engineers who are looking to work with cutting-edge tools often reject the manufacturing industry for being too outdated or take their skills to organizations that engage the latest technology.

Factories that use smart manufacturing methods give their workforce interesting tools to solve interesting problems. Younger engineers who previously dismissed the industry as antiquated are taking notice. Not only do smart factories appeal to new engineering talent, but they also better engage their existing talent. Attracting and retaining a strong, skilled workforce is another cost-saving benefit of digital transformation.

In recent times, manufacturers have struggled to recruit people for manual roles. Smart manufacturing reduces reliance on manual labor, allowing you to be more agile in recruitment while also ensuring that productivity and output remain consistent.

Step 3: Educate Yourself And Your Team

The smart manufacturing space is complex, but it can be simplified and understood if decision-makers surround themselves with the right information. There are plenty of online resources, but during the research stage, nothing beats face-to-face discussions with peers and experts at events and networking groups to understand how other manufacturers approached similar challenges.

Seek out examples of organizations that have been through digital transformation. What can be learned from their successes and failures? How did they align staff and set up the right teams? In the research phase, it is common for organizations to focus more on the technology, rather than the people who will be working with it. So, when learning from organizations that have already gone through digital transformation, it's essential to look for key takeaways around human resources and team structure as well as technology.

ASK FOR PEER TIPS

What are the challenges they encountered?
What best practices did they develop?

Attempting to research every technology that smart manufacturing has to offer will take up too much time.

While researching, focus on the big picture.



What can smart manufacturing help your organization achieve?



What challenges could it help your organization overcome?

Learning about concrete outcomes and how they can impact everyday processes will enable decision-makers to move on to strategy and planning.

Once in that phase, IT decision-makers will gain a deeper understanding of what is needed for their specific goals so they can narrow down the areas of technology they need to research more fully.

Speaking to our customers, we often find that before they start their digital transformation they attend trade conferences and ask pertinent questions from those who have already conducted the process.

Step 4: Develop Your Strategy In Collaboration

The next step is to **be clear** on your business objectives and how you are going to achieve them.

Work together with your team to develop a strategy for the modernization that you want to undertake. Set your expectations and agree on a clear path, timeframe and goals. Define these in a clear document so that everyone is aligned. By spending this time articulating the process upfront, you will make the whole journey significantly faster and smoother.

START WITH QUESTIONS AND ACTIONS

-
- 01 What do we want to achieve, what does success look like and how will we measure it?
 - 02 Identify your top objectives – such as “improving quality and reducing variability.”
 - 03 Set your key performance indicators (KPIs) accordingly.
 - 04 Which technologies require minimal investment and rapidly meet goals?
-

Once you have an idea of the type of problems you can solve with smart manufacturing and understand how it delivers value for your customers, you are in a great place.

In this step, narrow the field of research and look into the **technologies and systems** needed for the pilot.

Step 5: Identify People and Policies Impacted

Now it's time to establish your digital transformation team and create a clear strategy and rollout document that outlines everyone's roles and action points.

At this point, it's vital to determine if you have the right team in place. If you're planning to deploy machine learning and AI as a part of the pilot, do you have a data science team that can support it, or should you look for an Industry 4.0 partner that can offer a production-ready solution?

Are your policies in alignment?



CASE STUDY

One of Oden's customers tells us that they did not consider whether their IT systems could support the data load required or whether their security and human resources (HR) policies could align with the digital transformation project.

The customer had to learn how digital transformation translated to the team on the manufacturing floor using handheld devices, such as cell phones or tablets, to facilitate mobility. However, the customer's HR policy prohibited the use of personal mobile devices on the manufacturing floor. Safety was just one reason for this policy. So, the customer had to be creative about modifying its policies to allow limited mobile device usage to support manufacturing while preventing non-work-related activity.

Step 6: Select The Right Pilot Partner



Start small, scale fast and work with the right Industry 4.0 technology partner to help you achieve your business objectives. [Identify a problem you want to solve and pilot with a test-and-learn.](#)

Working with a trusted Industry 4.0 technology partner will make this part of the process much easier and help the organization proceed with greater confidence. The right partner will help you create a short pilot that is not only focused on the capabilities you want to test, but also meaningful enough in size that it offers a quick and demonstrable ROI. If the pilot is successful, it could be scaled quickly. Don't test just for the sake of testing. You'll waste precious time and energy of your people.

Consider trying various partners to find which ones are best positioned to help your business. Ultimately, it takes people, processes and technology working together to get a successful pilot off the ground.

Step 6: Select The Right Pilot Partner

When selecting vendors, here are some questions to consider:

CONNECTIVITY

- Do they have the ability to connect with your current machines?
- Can they connect devices across the entire line?
- Can their technology connect to product monitoring devices?

ACCESSIBILITY

- How easy is it to build algorithms?
- Is the data architecture on premise or in the cloud?
- Do they offer a hybrid data architecture of onsite + cloud?

FEATURES

- What are their reporting capabilities?
- Is it possible to create user-configurable dashboards?
- What insights will their analysis engine deliver?

PRICE

- What is the cost?
- How quickly is ROI demonstrated?
- Does the partner offer a variety of tools?

SUPPORT

- How much installation assistance is required?
- Will you need to change partners as you grow?
- Can they support your journey towards advanced features like machine learning and AI?

It is worth considering doing a pilot with several providers to see which ones can deliver on your organization's specific needs.

Step 7: Scale Fast To Continue To Evolve

Once your first pilot has been conducted, it becomes a lot easier to create follow-up test-and-learns, as the first pilot will provide the structure. Once you've proven value, it's time to scale fast, because expanding your digital transformation efforts immediately adds incremental value.

Becoming an intelligent enterprise is data-dependent. Manufacturers must ensure they have enough of the right data about processes or problems.

QUICKLY BUILD A WEALTH OF DATA BY

- ✓ Expanding digital transformation rapidly after the pilot
- ✓ Continuing to add additional machines, lines and systems

With these actions you can mitigate one of the biggest constraints that manufacturers face – the time it takes to build up the dataset required to create valid predictive models.



Step 7: Scale Fast To Continue To Evolve

Investing in open systems helps eliminate a lot of your risks. The best-of-breed open Industry 4.0 technologies can work with any legacy system and provide manufacturers with the holistic datasets they need to make critical decisions. Ultimately, the power of your industrial network is directly related to the number of assets you have connected.

As smart manufacturing gains momentum, organizations are plotting their own [paths to success](#).

The right partner will support your journey to becoming a smart factory.



Start Small



Scale Fast



Work With The
Right Partners

The sooner your organization gets started, the sooner it can start gaining insights, become more competitive, future-proofed and [more profitable](#).

Ready to transform your factory?



Ready To Start Your Digital Transformation Journey?

Get in touch with Oden Technologies for a personalized Industry 4.0 consultation.

BOOK NOW

**MAKE MORE.
WASTE LESS.
INNOVATE FASTER.**



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