THE DIGITAL MANUFACTURER: A BLUEPRINT TO AI

Artificial intelligence and machine learning are completely retooling the manufacturing sector. By harnessing their power to optimize every segment of your business, you can improve on the old way of doing things to achieve a better, safer, more profitable future. This blueprint will show you how to become a fully developed digital manufacturer.

PREDICTIVE MAINTENANCE

You can now predict the lifetime of factory components and machines, only conducting maintenance when it's needed, rather than according to use time or cycles.

PREDICT PRODUCT QUALITY

Digital manufacturing can let you predict the future by determining if a product has a flaw early on in the process, so you can save time, money, and resources.

DISASTER AVOIDANCE + HEALTH AND SAFETY

Digital manufacturers can use IoT and AI to monitor the shop floor for changing conditions and then flag dangers, saving time, money, and, potentially, lives.

FORECASTING VARIABLE DEMAND

With digital manufacturing, you can prevent inadequate quantities or improper mixes, making variable demand much more manageable up and down the supply chain.

REDUCE NEW PRODUCT TIME TO MARKET

AI tools can not only help design new products, but also optimize their manufacturing and reduce back and forth between design teams and those on the factory floor.

COMPONENT KEY

These tools and process inputs are the key components that you'll need to harness in order to build a fully digital manufacturing future.

Audio-visual processing to harness images and sounds from the shop floor

Collaborative software platforms to allow everyone, from data scientists to plant managers, to work together

Business intelligence to better understand what happens outside the factory

Enterprise resource planning systems to track where things are and where they need to go

Data warehouses to source historical data that can be used in model training

External data sources to explore real-world factors like competitor products and weather

IoT connectivity to record and process data from your machines in real time

Traceable product workflows to help understand problems in quality

Domain experts to provide human insight for your machine learning systems

Virtualization systems to optimize your shop floor with insights from your models

PREDICTIVE MAINTENANCE

The old way
Manufacturers conduct inspections and maintenance on their machines based on usage or time in service, whether the machines actually need maintenance or not.

The better way
The digital manufacturer is able to predict the lifetime of factory components and machines, thereby reducing the frequency of failures or eliminating them entirely.

COMPONENTS NEEDED

Data warehouses to store the historical data from IoT sensors

Real-time IoT connectivity to measure and record equipment states

Domain experts to understand the data, evaluate potential models, and adjust maintenance plans

DIGITAL TWIN

One of the best ways to optimize with predictive maintenance is to build a digital twin—a live, virtual representation of your workflows and processes. With a digital twin in place, you can adjust things virtually and let machine learning predict what the effects might be before you roll them out in reality, including their effects on equipment maintenance.

FORECASTING VARIABLE DEMAND

The old way
Set amounts of products are produced every week or every month, regardless of whether you're failing to meet demand or producing a surplus.

The better way
Digital manufacturers prevent inadequate quantities or improper mixes as well as limit revenue loss with machine learning. Forecasting with AI makes variability in demand much more manageable across the supply chain to ensure you have what you need, where you need it, when you need it.

COMPONENTS NEEDED

External data sources to understand the impacts of things beyond your control—for example, economic indicators, competitor product launches, weather, etc.

Business intelligence to understand changing downstream needs

Connectivity to **enterprise resource planning systems** to monitor what goes in, what goes out, and what's in process

BEER SUPPLIER

Beer demand varies with the weather, and making sure that you're producing sufficient supplies, while not producing so much that you can't sell it, often involves walking a tightrope. But with an AI system to forecast variable demand, you can not only make sure you're producing the right amount of beer at the right time, but also ensure that you have the inputs—like hops—on hand when you need them.

PREDICT PRODUCT QUALITY

The old way
Defects are a fact of life in manufacturing. You do what you can do to reduce them, but some products are bound to have problems.

The better way
Digital manufacturers leverage AI to identify low quality products early in their creation, thus eliminating waste, ensuring high quality outputs, and reducing energy usage.

COMPONENTS NEEDED

Traceable product workflows to help you understand where products have been so you can identify the source of defects

Domain experts to act quickly if low-quality products are being produced

IoT to monitor workflows as they happen

A **collaborative software platform** to train models and run them on data

Data warehouses to keep a historical record of all product quality tests

WASTE ELIMINATION

Creating steel is a time- and labor-intensive process, and it's often apparent early on if a piece of steel will have to be discarded or recycled at the end of the process. By predicting product quality early on, processes can be adjusted, and sub-par steel can be recycled sooner rather than later, saving you time and money while reducing environmental impacts.

REDUCE NEW PRODUCT TIME TO MARKET

The old way
From product designers to workflow optimizations, a lot of manual back and forth goes into getting the manufacturing process for a new product ready.

The better way
AI tools can not only help with the design of a new product. They can also reduce the back and forth between designers and process engineers as they plan out how to manufacture and assemble the new product, speeding delivery to customers.

COMPONENTS NEEDED

Data warehouses to explore similar, past products to inform current models

Business intelligence to provide inputs on needed features and markets

A **collaborative software platform** to pull data from these sources and optimize the efficiency of producing the new product

Virtualization systems to understand how products will be assembled and how they'll be manufactured

VIRTUAL OPTIMIZER

Shop floor managers oversee a huge array of processes and flows, and have to make decisions quickly based on their extensive experience. Virtual optimizers are tools that make this easier—not only do they display the current status of various systems, but they can prescribe adjustments you can make to improve output—and even automate these adjustments.

HEALTH & SAFETY

The old way
An annual training, a few posters, and a stack of hardhats go a long way towards reducing the risk of disasters on the shop floor, but they're far from a guarantee.

The better way
IoT and AI come together to monitor thousands of inputs every second, adapting to changing conditions to flag potential dangers whether they fit pre-defined problems or not, saving equipment, time, money, and, potentially, lives.

COMPONENTS NEEDED

IoT connectivity to monitor various aspects of the shop floor

A **collaborative software platform** to process data and warn about possible issues

Audio-visual processing to monitor use of safety equipment and procedures

SAFETY GEAR MONITORING

One of the most surefire ways to prevent health and safety issues is to ensure that everyone is complying with established standards and protocols. But if you've got 100s of people working on the shop floor, how can you monitor all of them? AI tools that process video can help flag workers who, for example, aren't wearing appropriate protective gear so that you can ensure your procedures are being followed.

Blueprint drafted by rapidminer