

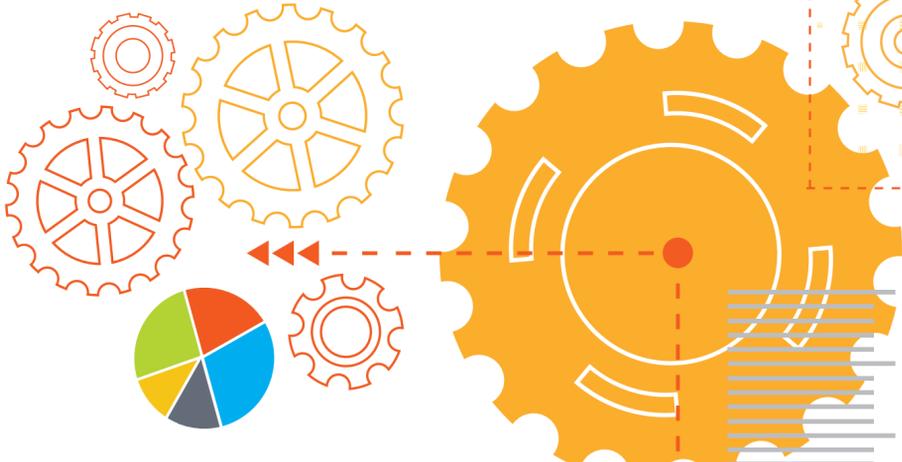
Are you an authority on DUMB manufacturing?

Dumb manufacturing relies on human mastery. It's directed more by the senses than by data.

Traditional operators used taste, sight, sound and smell to see if the printing presses were operating properly, the batter was tasty enough, or the piano keyboard was properly glued. Just as farmers tasted not just the crop, but the soil.

But! Reliance on human mastery cramps:

- Knowledge transfer
- Capacity to improve
- Alignment between plant floor and digital data
- Alignment between C-suite and plant floor.



Smart manufacturing lives on data and measurement

Smart manufacturing means dealing with a digital clone of the machines – built through sensor/IoT data, and continually improved by machine learning. So we can manage the machines when we're nowhere near them.

It puts intelligence in the system, rather than relying solely on people.

How do we get to smart manufacturing?

By catching four waves – just like a surfer. Plus a pre-wave, Wave 0.



Wave 0 – Enablement

Traditionally, the managers of control networks are gatekeepers. To prevent one glitch from bringing them all down, they isolate and protect the networks. Which means you can have 15 lines, run by 15 isolated networks – 15 fiefdoms.

The enabling phase of smart manufacturing, Wave 0, is to harness IT expertise to connect the fiefdoms.

IT and Control aren't always the best of pals... But if you don't catch Wave 0, you won't catch any of the others.

Wave 1 – Visualization

Visualization is the ability to see what's going on! What's running, what's down, what's trending, percentage waste, and so on.

Visualization elevates the productivity of every stakeholder, enabling action in real time. The IoT is turbo-charging visualization as we speak, including remote locations and your supply chain. With visualization:

- Accounting sees *total consumption*, to determine raw material costs
- Maintenance sees *stoppages and breakdowns*. Process Engineers see when machines are *running*
- Plant managers see exactly what a supplier is shipping
- And so on.

Wave 2 – Efficiency

Now you can hone in on efficiency. Let's use downtime as an example. With smart data:

- You identify and change subtle patterns, e.g. multiple small stops that add up to a considerable negative influence.
- You enable root cause analysis (again, the IoT keeps increasing drill-down potential, enabling you to see deeper and broader). You'll find out the top reasons why you're stopping, and the cost – the basis of continuous improvement.
- **Moving to the big picture:**
 - You'll know where energy is used, waste per line, and when you have rate loss. Now you can make the right choices to improve performance.
 - Everyone begins to speak the same language – there's one version of the truth.
 - Often, a friendly competition over KPIs develops between lines and shifts. Great for productivity and morale.

Wave 3: Now, improve quality with centerlining

Traditional quality management measures outcomes. This means, by the time you detect problems, you've already squandered resources on flawed products.

Centerlining is proactive. By controlling key input parameters, you run to target and achieve the right output. Do the right thing, consistently and continuously.

Of course, you cannot eliminate quality measurement of finished products. But by decreasing the variability of key inputs, centerlining considerably decreases waste. As well, centerlining enables efficient short orders.

80/20

Centerlining leverages the 80/20 rule

By determining the best settings and ranges for critical variables, eliminating variance in a handful (say 20%) of parameters, you can decrease 80% or more of errors.

Centerlining is one of the ways that smart manufacturing moves from art to science. It's measured, it's digital, it's scientific.

Centerlining never stops

Centerlining is ongoing, allowing for changes in equipment, raw materials, or other factors. If there's a discrepancy or variation in output, there's a reason.

Wave 4 – ERP integration

Wave 4 is about connecting to business systems: e.g. ERP / SAP / Oracle.

ERP systems exist to count money; your ERP tells you how many widgets to make, and when. While your MES tells you, in real time, what was actually produced, which materials used, and how much waste.

Until you have connected these two, you'll be scheduling manually (yes, using Excel is still manual). Your reaction time is slow, based on less accurate information.

Now you've closed the gap between the shop floor and the office floor. With insight in real time, further powered by the Internet of Things, everyone on the shop floor bases every decision on available, accurate information. Benefits include:

- Reduced over- and under-runs
- Right material is used; right amount of material delivered to lines at right time; schedule updates are communicated quickly
- Detailed traceability from ingredients through to finished goods.

Your opportunity to profitably deliver the right thing, at the right time, takes a giant leap forward.

Catch these four waves to leave dumb and move to smart.

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