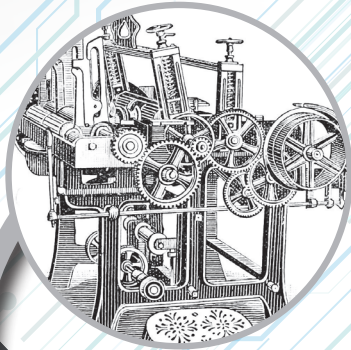


# SYNCHRONISING PRODUCTION PROCESSES

Creating demand-driven factory of the future



Machine



Inventory



Supplier



Actionable Information



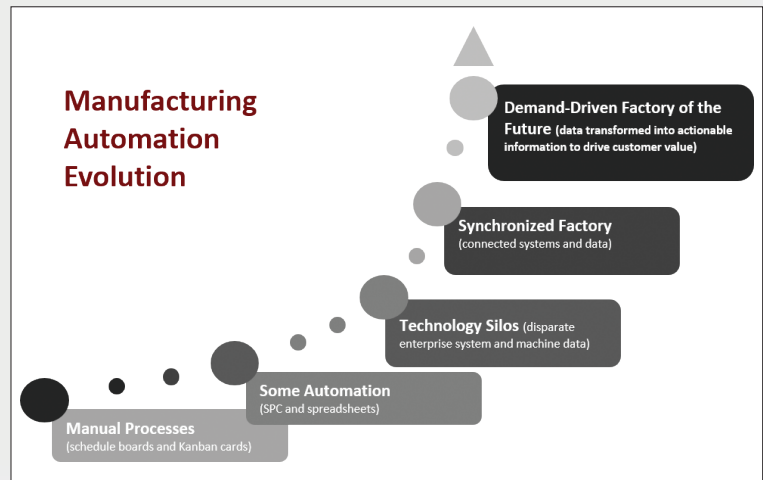
Customer

Using demand-driven principles and synchronised systems, manufacturers have learnt to reach new levels of communication, growth and customer responsiveness. Every forward-thinking manufacturing environment is somewhere on the path towards becoming more synchronised and demand-driven. The feature discusses how technology will connect enterprises and create demand-driven factory of the future.



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Vice President—Product Strategy  
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Every forward-thinking manufacturing environment is somewhere on the path toward becoming more synchronised and demand-driven



Production has stopped and no one is scurrying around to take care of the flashing red lights. An event that at one time would have caused serious downtime is now only a blip, thanks to the evolution of manufacturing technology. Today, the appropriate employees would be instantly notified of the outage and the problem quickly fixed because the factory is digitised and connected in real-time. Everyone - management, maintenance, production, planning, scheduling and more - have visibility into the production process because they are all on a single, synchronised platform.

In an afternoon continuous improvement (CI) meeting, some team members are clustered around a large flat screen — while others are accessing the same information on their smart phones miles away. The entire team comes to an agreement quickly because all of the facts are visualised. Enabling this is technology based on proven, demand-driven methodologies that encompasses the best of Lean, Six Sigma, and Theory of Constraints (TOC) principles. Enterprise, system and machine-level data is transformed into actionable information — making this CI meeting more collaborative and effective.

The following section examines the evolution towards becoming demand-driven—why more manufacturers are adopting this approach and how it changes the metrics measured; the way processes and teams are managed to be successful by providing an overview of some conditions and technologies driving the demand-driven manufacturing movement.

### The era of digital connectivity

We define demand-driven manufacturing as a process

that incorporates the best of Lean, TOC and Six Sigma principles. It describes production that is based on actual customer demand with the aim to synchronise everything (workforce, method, materials, machines, and information) in order to drive flow. This process is accelerated by technology that automates, digitises data and connects every function within the demand-driven organisation and to every layer of the supply chain.

**The Industrial Internet of Things:** The Internet of Things refers to connectivity between products and systems across nearly every aspect of life. This concept within the manufacturing industry is referred to as ‘The Industrial Internet of Things (IIoT)’. For manufacturers, this is the ability to collect, analyse and share data about materials, machines and processes in the production environment, in real-time. The power of this level of information is unquestionable. As such, the IIoT will bring exponential value to those companies who know how to use it.

According to a recent McKinsey Global Institute report, the Internet of Things has the potential to unleash as much as \$6.2 trillion in new global economic value annually by 2025. McKinsey also projects that 80 to 100% of all manufacturers will be using IoT applications by then, leading to a potential economic impact of as much as \$2.3 trillion for the global manufacturing industry alone.

Manufacturing equipment, products and planning and execution systems are more connected, allowing the people that use them to see what is really going on as it happens. The synchronised factory enabled by the IIoT is able to visualise and effectively overcome obstacles and bottlenecks that once prevented them from responding to their true priorities.



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The Industrial Internet of Things has been heralded as a way to improve operational efficiency (effectiveness). But in today's environment, companies can also use it as a tool for finding new - and unexpected - growth opportunities. Successful companies will use the Industrial Internet of Things to capture new growth through three approaches: boost revenues by increasing production and creating new hybrid business models, exploit intelligent technologies to fuel innovation, and transform their workforce.

### Connect, collaborate, compete

Research has shown that connected factories use this new intelligence to become more demand driven, and thus increase their competitive advantage. They pull together machine-level, inventory management, supplier and customer data - and transform it into actionable information. This information provides a big-picture view that identifies disruptions in real-time, coordinates a fast and effective response, and logs the cause and impact to direct your continuous improvement efforts.

In manufacturing environments, this level of synchronisation and integration allows teams to see information as it happens. They can:

- Collect tag and sensor data from machines, conveyor belts, HMI screens and Environment Management Systems (EMS);
- Collect transactions from RFID tags and capture business application information in a contextualised historian;
- Analyse this granular data to pinpoint causes of production variability, quality problems or wasted opportunities;
- Use the data to support operator and resource metrics;

- Create a work-cell information board to support gemba walks, plant-wide KPIs, and plant, business unit, and corporate gold standards.

The key is that this core data is automatically collected and used to evaluate and support decisions at all levels of the organisation. No more working from different data sets or pulling data from disparate business applications, spreadsheets and databases. Everyone is working from the same real-time information which, depending on their system, they can visualise in a number of different ways.

According to Aberdeen Research, one of the keys to a successful Lean operation is getting the baseline data and then tracking improvements. A good strategy can accelerate Lean's impact through:

- Improved access to data
- Self-service analytical tools
- Alerting to out-of-control conditions
- Management tracking tools for prioritisation of projects

Demand-driven factories can deliver on-time orders more reliably and gain capacity to meet future customer needs. As information is gathered by the software and placed in front of the people who need to act—they become more empowered and informed to improve the way things are done. The intelligent environment gives employees clarity about what is the number one thing they could be doing right now to improve overall company performance and the information to determine how to approach it. By shortening reaction time to disruptions and bottlenecks, and by focusing on the true driver of sustained growth—improved flow - they can exceed customer expectations. World-class effectiveness in the service of the customer order (and becoming more productive when looking for ways to meet customer needs in advance by



continuously improving) is how manufacturers unleash growth in a synchronised environment.

### Reactive vs proactive: predictive analysis

A reactive environment is replaced with proactive thinking when technology enables industrial predictive analytics, the gathering of information from data and using it to predict trends and behaviour patterns. When data links all of the moving parts in a manufacturing process, it can be used to create predictive intelligence to prevent flow disruptions and bottlenecks from occurring before they impact production.

For example, process engineers in such environments are now using predictive analysis triggered by machine-level 'warning states' to do preventative maintenance and repairs before the line goes down and compromises throughput. What's more, they can identify the metrics for demand-driven success with more confidence and direct these new activities with more visibility. The entire organisation can align behind these metrics and experience a transformation in the way they work. This improvement in process effectiveness allows real-time demand-driven flow.

### Demand-driven metrics

The demand-driven factory performs to flow-based metrics that are (ideally) visible to everyone on a shared technology platform in a connected enterprise. Production leaders predict and plan using three primary demand-driven metrics from Dr Eliyahu Goldratt's seminal book, *The Goal*, to ensure that their goals - to make money now and in the future - are met:

1. Throughput: Throughput is calculated as the selling price of the product minus totally variable costs per unit.
2. Investment (I) (inventory): All the money currently tied up in the system, which the company intends to sell. As used in TOC, investment refers to the equipment, fixtures, buildings, etc that the system owns as well as inventory in the forms of raw materials, work-in-process and finished goods.
3. Operating expense (OE): All the money the organisation spends in turning investment into throughput.

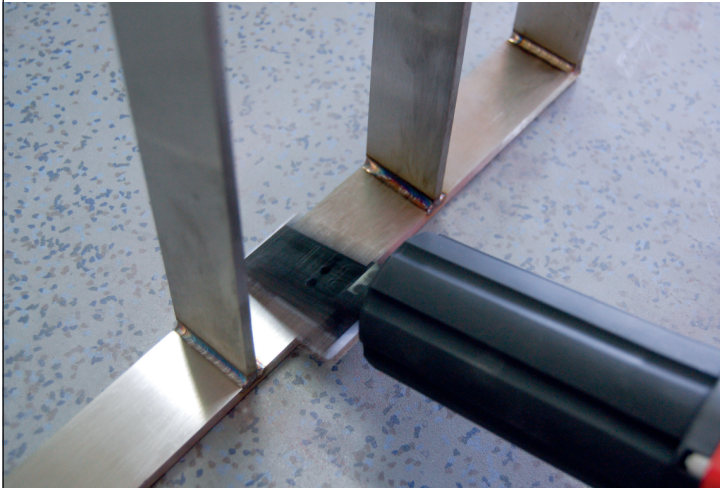
There is also a critical change in mindset from traditional, unit-costing measures utilised today to measure local efficiencies to global effectiveness.

While data silos are still commonplace, those

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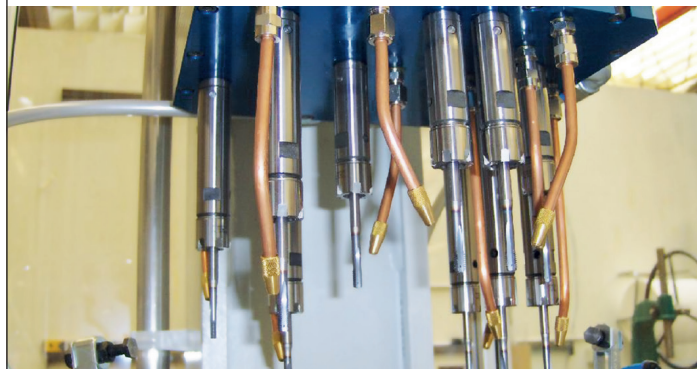


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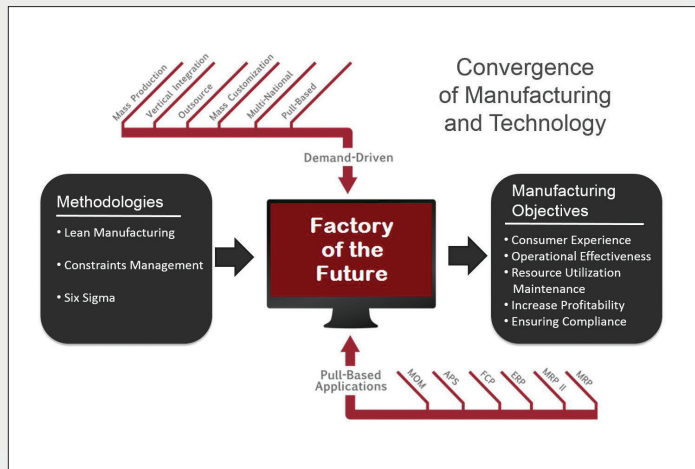
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The graphic shows the convergence of manufacturing and technology, which is defined as the demand-driven factory of the future

manufacturers who are synchronising systems have more comprehensive, actionable knowledge about their production cycle. They gain transparency in managing customer orders, expenses and investment across the enterprise and drive for continuous improvement—improvement that leads directly to profitability and a competitive advantage.

### Real world results

Wenger® Manufacturing, who now uses a synchronised, demand-driven production planning, scheduling and execution platform that connects to their ERP system,

- Increased on-time delivery from 40% to 95%+;
- Experienced a WIP reduction of 15% in the first few months, and;
- Reduced stock outs of stocked parts by 25%

This capital equipment manufacturer for extrusion processing applications returned to profitability for the first time in three years by gaining visibility to their flow and acting on these signals to meet customer demand. They also achieved the ‘grand prize’ of sustainable manufacturing success—user buy-in: “Organisations that can centralise and consolidate their systems are more equipped to unlock the value of their data and, as a result, get buy-in from their users. When approached effectively, manufacturing data can help companies grow and support the vision for a more knowledgeable, effective organisation.”

Another manufacturer used their improved connectivity to achieve record capacity and improve customer lead time from three weeks to five days. New manufacturing software delivered clarity about constraints to improve flow. The connectivity that drove those changes on the floor also helped them accelerate throughput and improve delivery time. They

achieved additional workforce utilisation as well, effectively creating new ways for their employees to contribute to positive, profitable change and continuous improvement.

### Demand-driven factory

Demand-driven manufacturers succeed when they use technology to gain capacity and solve customers’ most pressing business issues. With clear objectives monitored by KPIs, everyone - from managers to shop floor personnel - becomes empowered to improve not only their individual performance, but the entire plant. After gaining real-time visibility into what is actually happening out on the floor and the extended supply chain, they know which metrics lead to improving these objectives—and can act on them. In many cases, their compensation also becomes tied to these objectives.

This level of Manufacturing Intelligence (MI) is the driver to enhancing value. As Aberdeen Research reported in January 2014, ‘manufacturers that effectively harness their MI achieve meaningful results.’ They used four key performance criteria to distinguish the best-in-class (top 20% of aggregate performers) from all others (bottom 80%). The best-in-class achieved the following performance metrics:

- 96% successful new product introduction, versus 82% for all others
- +26% increase in operating margin, versus corporate plan, versus +6% for all others
- 94% Operating Equipment Efficiency (OEE), versus 81% for all others
- 99% on-time complete shipping, versus 90% for all others

In today’s complex manufacturing environments, the physical processes of manufacturing encompass so many moving parts that only digitising their respective components will yield demand-driven results. □