



2017

TOP TEN TRENDS

in Modern Demand-Driven Manufacturing

Demand-Driven Manufacturing is a method of manufacturing primarily used by discrete, custom manufacturers¹, where production is based on actual demand (orders or consumption) rather than a forecast. This is enabled through a synchronized, closed loop process between customer orders, production scheduling, and manufacturing execution - all while simultaneously coordinating the flow of materials and resources across the supply chain. The key components of Demand-Driven Manufacturing are synchronization and flow.

Modern Demand-Driven Manufacturers are today's truly Lean thinkers. While they are continuously improving, they are also innovating. Modern Demand-Driven Manufacturers realize that this combination not only gives them an advantage in the marketplace, but it drives their efforts to work smarter, more profitably and exceed expectations. Modern Demand-Driven Manufacturers embrace technology, but with a different lens. Solutions, not just systems, drive progress.



The 2017 Top Ten Trends for Modern Demand-Driven Manufacturing is based on interactions with hundreds of manufacturers and industry experts – addressing challenges, supporting innovation and introducing technologies. The constant, key themes that rise to the top are digitization, synchronization and visibility.



1. DIGITIZING THE SHOP FLOOR

By now, we all have a good idea of what the Internet of Things (IoT), or Industrial Internet of Things (IIoT) refers to, but the question is how do manufacturers get there? Enabling a fully digitized, interconnected enterprise is daunting, particularly when thinking about the vast amounts of data housed in hundreds (if not thousands) of various assets in and around the plant floor as well as in different business systems across the enterprise. And while many manufacturers are diligently routing data to massive data warehouses or data historians, most can't easily - let alone quickly - access the data they need when they need it.

The value proposition of the IoT is ubiquitous, real-time data sharing across machines, tools, sensors and systems - anything that collects useful data. The ability to do such will help manufacturers work smarter (e.g., enable Smart Manufacturing) and more competitively, impacting not only core KPIs, but more forward-thinking initiatives that will keep production moving and downtime to a minimum.

Modern Demand-Driven Manufacturers are connecting their environments – within individual plants, across an enterprise of multiple plants and throughout the extended supply chain – while keeping data in its host environment. Data is accessed, aggregated, analyzed and shared by “normalizing” data and making it accessible in real-time through technologies like SignalR. Data becomes fluid, making it easy to flow within the boundaries set.

While there are hardware devices that work to normalize data, Modern Demand-Driven Manufacturers are looking toward lighter weight, more flexible - and this is important - *scalable* software systems that can normalize data, make it accessible, and help effectively transform that aggregated data into performance-improving information.

Given the previously mentioned vast amounts of data in various assets, start small and scale by connecting assets in a manageable way. Focus on corporate or Lean initiatives (or one of the other items on this list), get some traction, and keep the data flowing.



2. SUPPLY CHAIN COLLABORATION AND VISIBILITY

For many, collaboration and visibility are one in the same. Greater visibility leads to greater collaboration.

This has been an increasing area of concern for Modern Demand-Driven Manufacturers – and rightly so. Driving growth and sustaining a competitive advantage is based on meeting customer demand. Meeting customer demand is dependent on a high performing supply chain. Real-time visibility into demand signals, materials replenishment status, stock buffers, inventory levels – even supplier SLA (service level agreement) compliance – keeps everyone informed of status and provides valuable decision-driving insight.

“Greater visibility leads to greater collaboration.”

Supply Chain Visibility (SCV) is increasingly becoming an area of research focus for Gartner, stating that SCV adoption is no longer a “nice to have” for any manufacturer. Adoption rates are growing across industry segments with industrial manufacturing leading the way at nearly a 20% rate.² Gartner also suggests that visibility initiatives should be closely aligned with business drivers and risk management to lend focus and realize the greatest initial return. We couldn’t agree more and have several use cases that demonstrate how this has played out successfully.

One manufacturer we worked with in the last year proved an interesting case for improving both supply chain visibility and data normalization (see #1). A growing part of their business was providing global supply chain services where they would receive parts from original equipment manufacturers (OEMs) and supply them to contract manufacturers. On both ends of the spectrum, they would receive forecasts – all in different formats, and one more clunky than the next. They also managed a couple thousand stock keeping units (SKUs). They were in constant state of flux, working to manually normalize data from multiple sources (spreadsheets) while trying to juggle the variation of supply and demand. Visibility for them means a single screen where they can view real-time replenishment, inventory and order status – and provide similar views to their OEM and contract manufacturing partners.

It goes without saying that the level of visibility many manufacturers need goes hand in hand with manufacturing digitization. In addition to the example above, another real-world example is from an aerospace and defense manufacturing client with composite parts requiring 12 hours in an oven. Before they became fully digitized, they wouldn’t know there was a quality issue on these parts until they came out of the oven. Today, quality and maintenance engineers are instantly notified of issues – and production can immediately rebuild or reroute parts to another oven. Time is money; and for them, the ability to pre-empt these types of issues represented a significant savings.

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3. MULTI-PLANT, ENTERPRISE WIDE VISIBILITY

Visibility at all levels is becoming increasingly critical for innovation, competitive value, synchronizing activities, traceability, production flow – and the list goes on. As customer and customization demands increase, more Modern Demand-Driven Manufacturers are relying on greater visibility at the value stream, supply chain, or enterprise levels to drive increased performance.

Multi-national enterprises need another layer of real-time visibility. Whether by the business, operations, compliance, or other stakeholders, universal visibility into plant status means you can quickly make adjustments, manage risk and monitor progress toward company key performance indicators (KPIs) across global locations.

Complexity increases with production interdependencies involving multiple plants – and status needs become even more critical. For example, a large electronics manufacturer that sub-contracts parts to manufacturers around the globe had no visibility into the status of their contracted orders. This resulted in disruptions up and down their inter-dependent supply chain. Visibility for them means real-time communication and status on order receipts, replenishment, and delivery to keep production flowing across their enterprise.

Start visibility efforts in a manageable way with a proof of concept at an initial plant. Gain adoption, collect some wins and get an understanding of the information most valuable in driving improvements. Then begin expanding across the enterprise.

“Visibility for them means real-time communication and status on order receipts, replenishment and delivery to keep production flowing across their enterprise”



4. SMART DATA, SMART DECISIONS – MANAGING BIG AND NOT SO BIG DATA

One client has over 200 disparate databases. Another has multiple data warehouses. Both say these sources are ineffective because they can't access the right data when they need it. Gartner research reported that on average, 70% of factory data goes unused.³ In managing big and not so big data, digitization is one thing; accessibility is another.

Consider the quality analyst that needs to pull data from every individual resource along the value stream for root cause analysis. How much time (and potential scrap) could be saved if they could view status and access real-time data from all those resources through a single screen? And how much downtime could be mitigated if, through the aggregation of machine historian and real-time sensor data, overall equipment effectiveness (OEE) metrics could be always visible to facilities and maintenance teams to better manage equipment and perform preventative maintenance? The ability to quickly access the right data for informed, effective, and timely decisions can dramatically impact production flow and profitability.

Business intelligence tools have been around for a while, but for many, you need to rely on a constrained IT resource to get the reports needed. Modern Demand-Driven Manufacturers require easy to use tools developed for manufacturing. Tools that empower *everyone* in the organization to conduct their own analyses and create their own reports and dashboards with data aggregated from multiple sources.

We are already seeing manufacturers working smarter through digitally connected, IoT-enabled environments. It comes down to the ability to access data and turn it into information. Information that can be acted upon to innovate and improve operations and, ultimately, business results.



5. AUTOMATING MANUAL PROCESSES

The digitization of manufacturing certainly automates the arduous task of data collection, aggregation and sharing across machines and systems. There is, however, a surprising number of manufacturers still using spreadsheets for production scheduling and manual Kanban cards for inventory replenishment. Modern Demand-Driven Manufacturers automate these manual activities and earn a quick return on their technology investment.

A manual Kanban system is generally manageable up to 200 SKUs. Organizations still, however, need to contend with lost cards, human error and non-stop communications with suppliers. Modern Demand Driven Manufacturers adopt eKanban (electronic Kanban) systems that automate the entire replenishment process based on real-time demand signals. While these systems typically pay for themselves just in right-sizing inventory alone (one client saved \$985,000 in the first year), they also tend to reduce lead times, carrying costs, and increase inventory turns.

What is surprising is the number of large manufacturers still scheduling production using spreadsheets. What we have found is that many reverted back to spreadsheets after discovering severe limitations in the scheduling capabilities that came with their enterprise resource planning (ERP) system. The problem with spreadsheets is that they quickly become outdated because they are not connected to the other business systems, have severe multi-user restrictions, and generally do not incorporate best practices in scheduling. When demand and priorities change (which inevitably happens), you have expeditors running around trying to point operators to what to work on next, injecting chaos into the process, while putting on-time delivery in jeopardy.

Modern Demand-Driven Manufacturers have abandoned spreadsheet scheduling in favor of software that works with the ERP system to access order information and then aligns the necessary resources and materials. Modern demand-driven planning, scheduling and

execution software ensures all the elements needed to complete the order - people, materials, machines, methods and data - will be available when they are needed; before the order is released into production. The software is also aware of system constraints and sets the pace for production accordingly, to keep production flowing at optimum levels. And when changes in demand occur, the software dynamically adjusts. These best of breed systems pay for themselves in increased capacity, reduction in order lead times and manufacturing cycle times, increased throughput and more. Case in point: A pump manufacturer increased capacity such that they expanded their market and doubled their revenue in 2.5 years.



6. REAL-TIME COMMUNICATION PROCESSES

For just about every company, communication represents some type of challenge. In variability-prone manufacturing environments, communication presents a unique challenge. When seemingly minor priority and status changes can have dramatic impact up and down the supply chain, how can manufacturers ensure everyone is on the same page? That operators know what they should be working on next? That maintenance is responding now to a machine down alert?

In absence of a system of record that can be accessed by all, what can be done? Some Modern Demand-Driven Manufacturers are leveraging their planning, scheduling and execution system as the system of record. With back-and-forth ERP integration, universal accessibility and real-time production status, communication of priority jobs and what to work on next is clear.

A single version of the truth generates a more consistent, Lean and waste free supply chain. Another option for enabling this is through a visual factory information system that can connect to any data source and display graphical visualizations configurable to the individual user, work center, plant or multi-plant/enterprise level. Order and machine status, system alerts, stock buffer, KPIs and more can be made accessible to everyone; anytime, anywhere, providing a single source for real-time information.

One client uses a visual factory information system to provide both leadership and operators the ability to easily show and monitor metrics and other information related to their core KPIs of safety, quality, delivery, employee and cost. With the heightened level of visibility the system provides, they can quickly respond to maintenance issues and keep downtime to a minimum; address quality concerns by drilling down into data to perform root cause analysis; and monitor KPI dips to ensure throughput is maximized.



7. COMPLIANCE AND TRACEABILITY

For manufacturers under regulatory restrictions and/or specific customer requirements, tracking, auditing, and demonstrating compliance has become a growing concern. New mandates for the beverage industry has wine and beer manufacturers looking for added layers of traceability. Manufacturers of consumable products need to trace product lots to minuscule levels while government contractors must demonstrate that only operators with specific skill, or clearance levels, performed specific tasks. While these activities require the ability to track and trace, they also need to conform to associated standardization and governing bodies including the International Organization for Standardization (ISO), Code

of Federal Regulations (CFR, which includes the Food and Drug Administration), the International Society of Automation (ISA) and CE Mark certification.

Modern Demand-Driven Manufacturers keep a tight rein on their product genealogy through workflow systems that track and trace production routing and process flows using serialization. Such workflow systems are highly configurable to adjust as mandated requirements change - and digitized to easily pull data from other systems, including historians, asset management, inventory management and more.



8. ACTIONABLE METRICS

Manufacturers are diligent about measuring metrics. So much so that we often find that they are measuring everything and anything - and often producing contradictory results. If you consider Eliyahu Goldratt's insightful, "Tell me how you will measure me and I will tell you how I will behave", there may be a lot of confusion in the ranks about what they should be working on or worse, people working on the wrong things.

More Modern Demand-Driven Manufacturers are turning their focus toward actionable metrics grounded in Lean, constraints management and Six Sigma principles. Actionable metrics are operational indicators; select metrics that can be acted on to improve production flow and ultimately, throughput. For example, a specific actionable metric for demand-driven manufacturers is Constraint Productivity; a metric that determines whether a constraint resource is operating at its optimal capacity. Manufacturers monitoring Constraint Productivity want to get to the point where they are releasing work into production at a pace that equals the constraint resource's optimal production level. This is the pace at which the constraint keeps flow moving throughout the entire production process.

The goal of an actionable set of metrics is to provide real clarity around the elements that drive organizational excellence and enhance demand-driven results. There is a white paper and guide on [Demand-Driven Manufacturing Metrics for Action](#) that provides additional information and examples.



9. SOLUTIONS VS. SYSTEMS

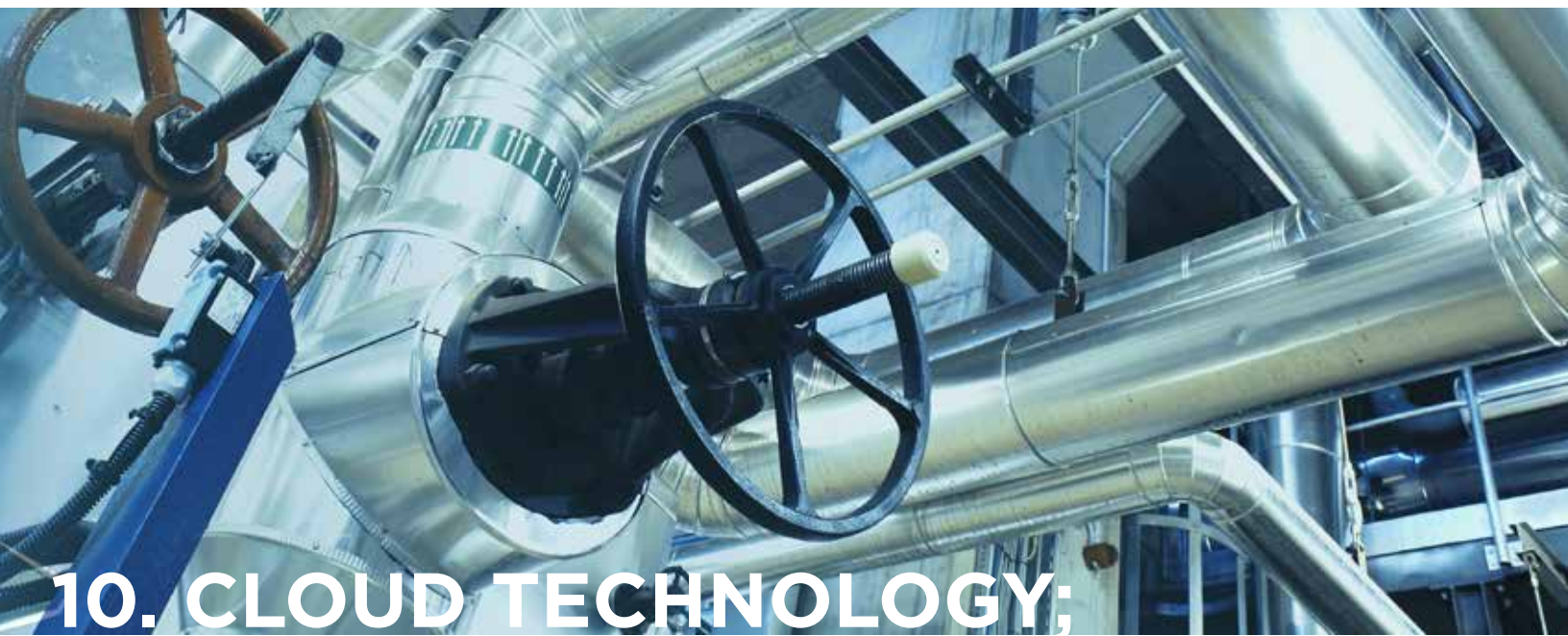
As more technology options become available, more manufacturers seem to be wrestling between the value of investing in best of breed solutions that meet specific functional requirements versus large, multi-functional systems (think ERP, manufacturing execution system or MES, etc.). For example, an ERP system may address financial transaction requirements brilliantly, but the scheduling module also bought with the system doesn't really work the way the organization needs it to work. So, they are back to scheduling on spreadsheets.

The large, multi-functional system approach means the company is dealing with a single vendor. There is inherent benefit there, but is it just convenient rather than innovative? And is it fully addressing the organization's key challenges?

“Modern Demand-Driven Manufacturers are sourcing solutions to work with their existing investments”

In meeting with several manufacturers “looking for MES systems”, they all indicated different challenges leading them in that direction: End-to-end visibility; traceability; adaptive production planning and scheduling; inventory down-sizing (right-sizing); and real-time machine status. In addition, a technology manager at a winery needed better quality, traceability and execution tools to support new compliance regulations in the wine and beer industries. And an electronics manufacturer with several contract manufacturers around the globe was in desperate need of better visibility across the supply chain. Addressing these individual issues doesn’t require an entirely new MES; just certain capabilities within a typical MES.

Manufacturing and technology are merging like never before. Flexible, scalable and highly configurable web-based and Cloud-enabled solutions are supporting manufacturers looking to innovate and work smarter in the midst of increasing complexities and competitive pressures. Rather than looking for large scale system replacements (unless that’s what is really needed), more Modern Demand-Driven Manufacturers are sourcing solutions to work with their existing investments – and paying only for the new capabilities they really need. Technology has risen to the challenge, why not embrace it?



10. CLOUD TECHNOLOGY; SAAS DELIVERY

“Cloud-enabled manufacturing execution systems (MES) will grow by nearly 20% in 2018”

Gartner research suggests that while wide adoption of Cloud computing in manufacturing operations may be 5-10 years out,⁴ expectations are huge as digitization, Industry 4.0, Smart Manufacturing and the Internet of Things rapidly unfolds, providing unique opportunities for differentiation and innovation. Another Gartner report suggests that adoption of Cloud-enabled manufacturing execution systems (MES) will grow by nearly 20% in 2018.⁵

Modern Demand-Driven Manufacturers are already looking to the Cloud to extend, or add value to existing legacy system investments. Rather than ripping and replacing large systems, these manufacturers are augmenting them with highly flexible, scalable and interoperable Cloud-enabled solutions that can be configured to work exactly how they need them to - without large customization fees. For many, these hybrid Cloud environments are becoming a popular way to validate the value proposition of Cloud computing.

Additionally, based on demand, more and more software vendors (Cloud or not) are adopting software-as-a-service (SaaS) subscription models for licensing solutions. For many Modern Demand-Driven Manufacturers, the SaaS model is more palatable from a budgeting standpoint. Absent is the large, initial software licensing fee and the annual support and maintenance fees. SaaS incorporates support and maintenance (upgrades) into the monthly subscription, which can be cancelled, typically upon 30 days' notice.

¹Custom manufacturers include engineer-to-Order (ETO), make-to-order (MTO), build-to-order (BTO), make-to-stock (MTS) and hybrid environments.

²An Industry Perspective on Supply Chain Visibility; Gartner, January 2016.

³Predicts 2016: Opportunities Abound for the Factory of the Future to Reach Its Potential, Gartner, 2016.

⁴Hype Cycle for Manufacturing Strategy, 2016. Gartner, 2016.

⁵Digital Manufacturing Requires a New Look at Old Systems, Gartner, 2016.

About Synchrono

Synchrono® LLC enables the digital demand-driven visual factory of the future; synchronizing people, processes, machines, materials and data to drive production flow from order inception to delivery. The award winning Synchrono Demand-Driven Manufacturing Platform includes a production planning, scheduling and execution system; ekanban inventory replenishment and supply chain collaboration software; a data collection, historian and automated workflow engine; alert management and monitoring software; and a real-time visual factory information system. The Platform components may be implemented independently or collectively to enable the Internet of Things and an unprecedented foundation for communication, collaboration and continuous improvement. Synchrono helps clients manage constraints, improve flow and drive on-time delivery to maintain a competitive edge. Sync with us at www.synchrono.com and follow the Demand-Driven Matters blog at www.synchrono.com/blog.

