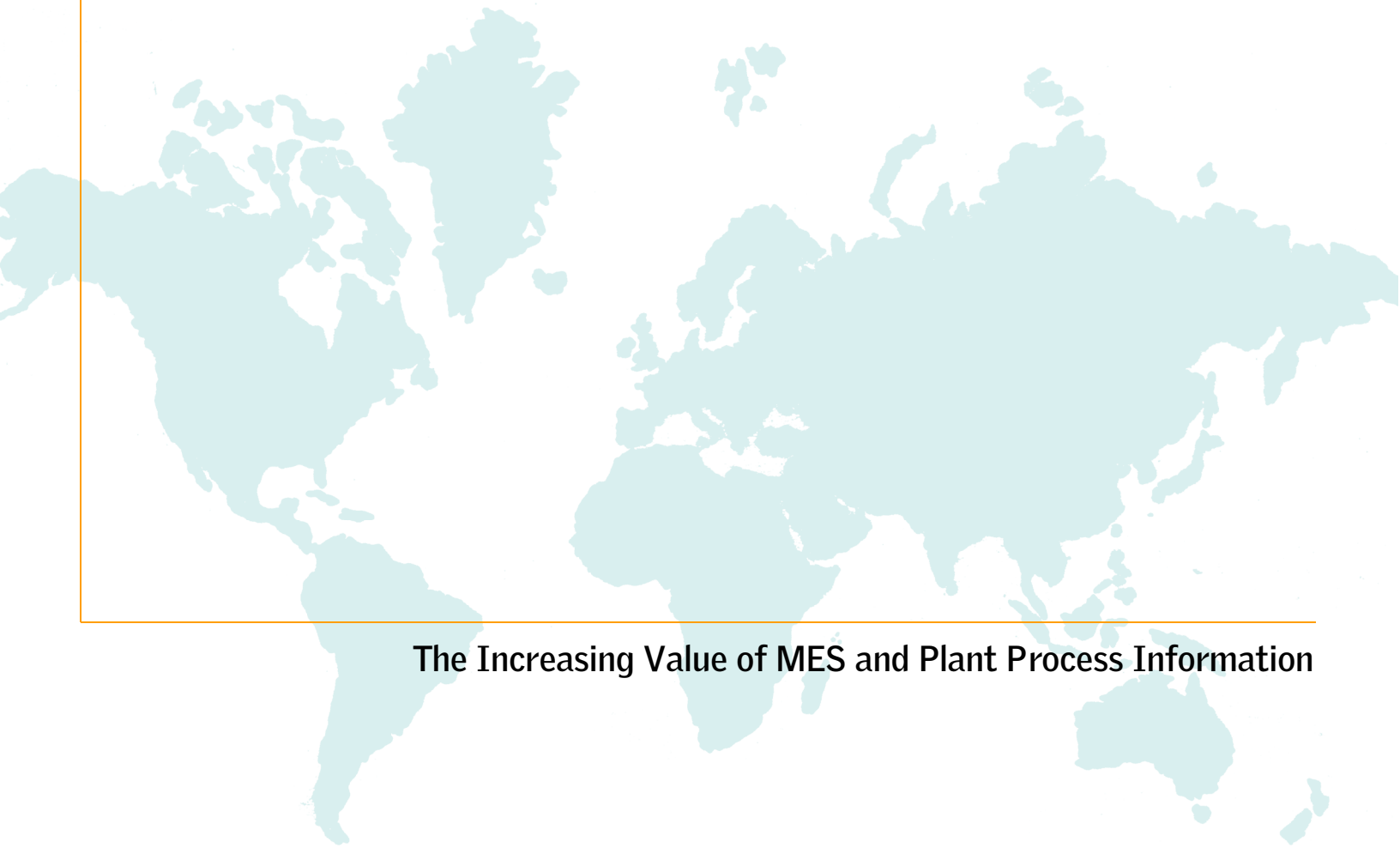

The Increasing Value of MES and Plant Process Information

Collaboration Synergies Inc.

About the Author

Michael McClellan has over 30 years of experience serving and managing manufacturing enterprises. He has held a number of positions in general management, marketing and engineering, including President and CEO for a multi-division equipment systems supplier. In 1984 he and a group of associates founded Integrated Production Systems, a company that pioneered the use of computer systems to manage and track production events on the plant floor. His first book, *Applying Manufacturing Execution Systems*, defines manufacturing execution systems and explains the reasoning and history behind them. He is a frequent speaker at companies and manufacturing conferences, has presented a number of papers on plant information systems, and holds one patent. He has recently completed a new book, *Collaborative Manufacturing: Using Real-time Information to Support the Supply Chain*.

He currently lives in Washington state and is President of **Collaboration Synergies Inc.**, an advisory company providing consulting services in the areas of business process management, collaborative manufacturing system development and implementation, plant floor information systems and manufacturing execution systems.

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The investments made in production process and value chain systems are playing a larger role and gaining in value as companies move toward collaborative uses of data to support core business processes. Originally these systems were acquired to support narrow functional requirements such as production order tracking, quality assurance, warehouse management, or maintenance management but in the new environment of collaboration, information sharing, real-time business, and broader compliance requirements, their place and value in the corporate IT portfolio hierarchy is increasingly significant.

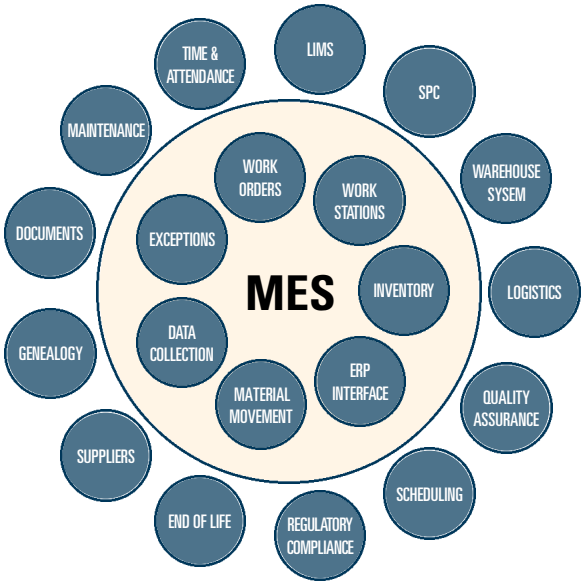
Gaining Respect

Manufacturing systems have long played the Rodney Dangerfield role – a role where they could not get any respect. Compared to the enterprise requirements planning (ERP) system or the customer requirements management (CRM) applications or even supply chain management (SCM), production support needs such as manufacturing execution systems or warehouse management applications were frequently treated as unwanted step children. Though needed, loved, and protected by departmental managers, most plant systems have been difficult to justify on the basis of reduced costs and usually fall below the radar of corporate information technology managers. But the times are changing. There is now much higher value being placed on the information detail that is generated and used by events and processes within the production and logistics world. This is where the value-adding action is in a manufacturing company, and as businesses move closer to operating in a near real-time environment, reports that are records of yesterdays events are simply too late or do not have enough detail to support everyday business decisions. In the sense-and-react environment of modern businesses, it is the data generated as events are occurring that provide the best basis for management decisions and actions.

The Manufacturing System

It is difficult to easily identify or define the full range of applications used to accomplish production because industries are different and vendors have never hesitated to add to the confusion by using labeling to suggest differences. The broad definition begins with a holistic view that includes the complete production system infrastructure, the collection of business processes that provide the event-by-event real-time management and execution of the planned production requirements. But even that is not an adequate definition until we include each enterprise in the value chain on both the supplier side and on the demand side.

In an individual plant there could easily be 40 or more applications generating information or controlling manufacturing processes. In this illustration many of the typical plant processes are shown. Although the term has wide meanings, for purposes of this article I will describe the collection of these applications as the manufacturing execution system (MES) and/or the enterprise production system.



Life would be easy if the plant processes were as simple as this illustration suggests. Unfortunately, reality is a bit messier with plants typically running 20 to 40 different applications that have been installed over the past 10 or more years. Within a multi-plant company or within a supply chain, the number of applications can grow to hundreds of disparate data generators and information sources. The value of these applications has been typically based on each system as a stand-alone answer to a particular set of operation conditions. The aggregate value of the manufacturing execution system is not considered because business tends to think of these applications in a data-centric view.

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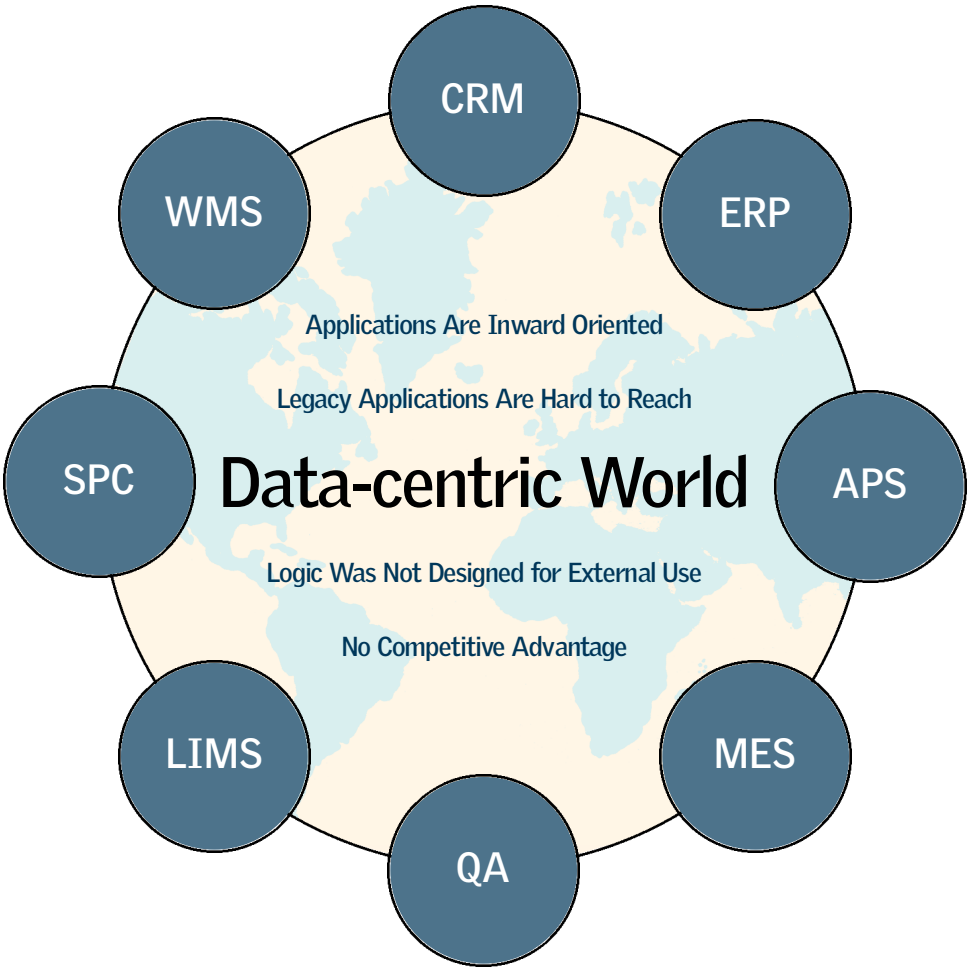
Data-centric View

The data centric view is narrow and focuses on the original requirements to support a specific process causing the functionality to be designed and built with a very inward sense. As an example consider an application designed to support the quality assurance department. Although important quality management issues such as statistical process control, non-conformance measurement and statistics, corrective action support, in process test, and more, are usually included, rarely will the package address or have any connection to equally important issues such as WIP tracking, cost variance, or scheduling. Early material requirements planning (MRP) systems were often described as closed loop systems. The operator entered data, the software did the calculation, and clear truth emerged. It was indeed a closed loop that focused on internal mechanisms (pure logic unadulterated by outside forces) to deliver an answer. This inward focus toward a narrowly identified list of departmental functions is what drives the frequent reference to many plant systems as islands of information. A much greater value can be envisioned when we alter our thinking away from the data-centric view to a process-centric view.



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Shifting to Collaboration

There is a major shift occurring in the use of this information from the historical use of managing a plant floor department or function to a much broader role of providing real-time information necessary to manage the enterprise business processes and support collaborative initiatives across the value chain. In life science industries process applications provide FDA regulatory compliance confirmation information. In discrete item industries, the primary source for product genealogy information including component sourcing, quality assurance confirmation, and product run-in test data resides in process applications. Meaningful key performance indicators and business performance management initiatives are likely to require the key data items that are found in the production system and available in near real-time.

Defining Collaborative Manufacturing

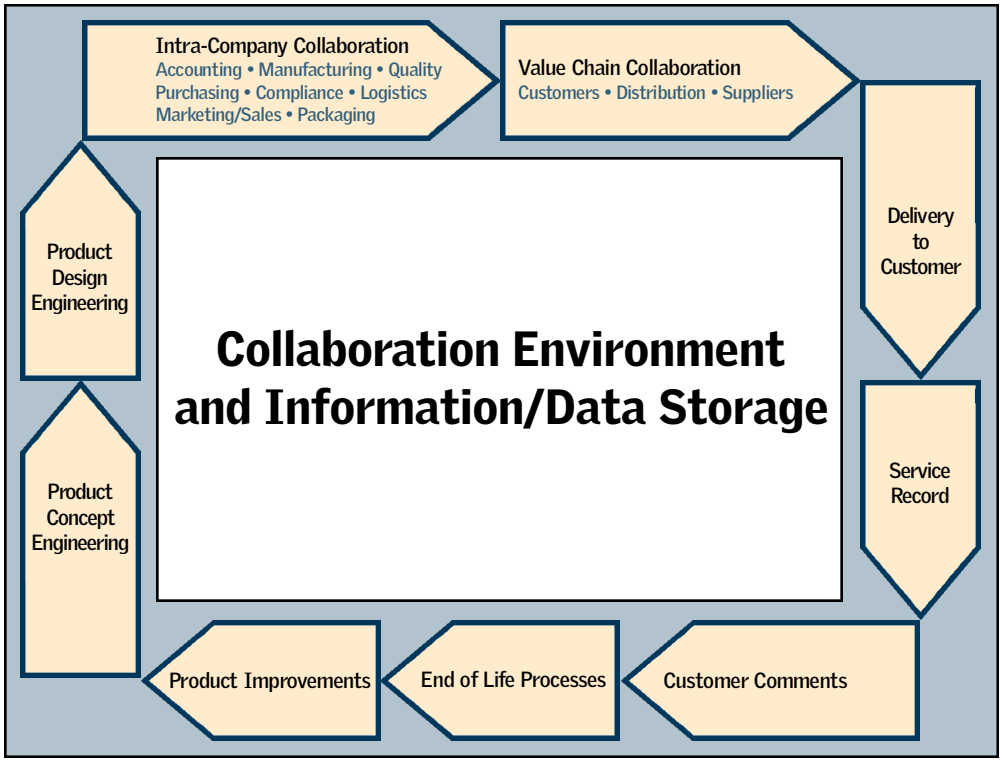
Simultaneous use of real-time information across the value chain

Business management is increasingly using a business process focus as we drive toward greater participation in information sharing and collaboration. Broader real-time business issues are being addressed through initiatives such as analytics, business activity monitoring/management, business process intelligence, business performance management, digital dashboards, supply chain event management, collaborative value chains, product lifecycle management, the real-time enterprise, and so on. The list continues but all of these initiatives center on the idea of real-time information sharing and use, preferably from its originating source. In the typical value chain, that source is usually the manufacturing execution systems within the business unit and/or value chain partners.

The value of the information changes when used to support higher level business processes. The data has one value when generated for a department supervisor for management purposes and quite another value when the data is also used to meet Sarbanes/Oxley compliance needs. Another example is how the value of quality assurance information increases substantially when used to support enterprise wide warranty exposure issues. Inventory information takes on a different look when viewed across a value chain with synchronized schedules based on real demand. This greater value comes by changing from a data-centric view of manufacturing applications to a process-centric view of the how higher impact company processes can be supported.

Business Processes

Many newer business initiatives, including applications of collaborative manufacturing strategies, require near real-time information availability to satisfy even simple needs. The strategy of synchronizing inventories and production across a value chain requires knowing the current status of events, what is occurring at this moment, what is expected, and so on. It is not enough to have a report of what happened last week or even yesterday. To be "in sync" requires current knowledge from the processes themselves – not an assumption of what was scheduled or what should have happened. Other forms of synchronized production including lean manufacturing and demand-driven manufacturing are based on manufacturing to actual demand in an online environment, completing the management information loop with process data that confirms compliance with value chain objectives. The ideas behind these management concepts are based on near real-time interaction of confirming information among value chain partners using the full array of production system components as intelligent information sources.



Product Life-cycle Management

representative steps in a value chain product lifecycle

Product lifecycle management can include data from product design through end-of-life processes. Many of the components of PLM are supported by data that originates during the manufacturing process and is stored in production applications. Product genealogy information such as test results, quality assurance data, and component source information are a few examples.

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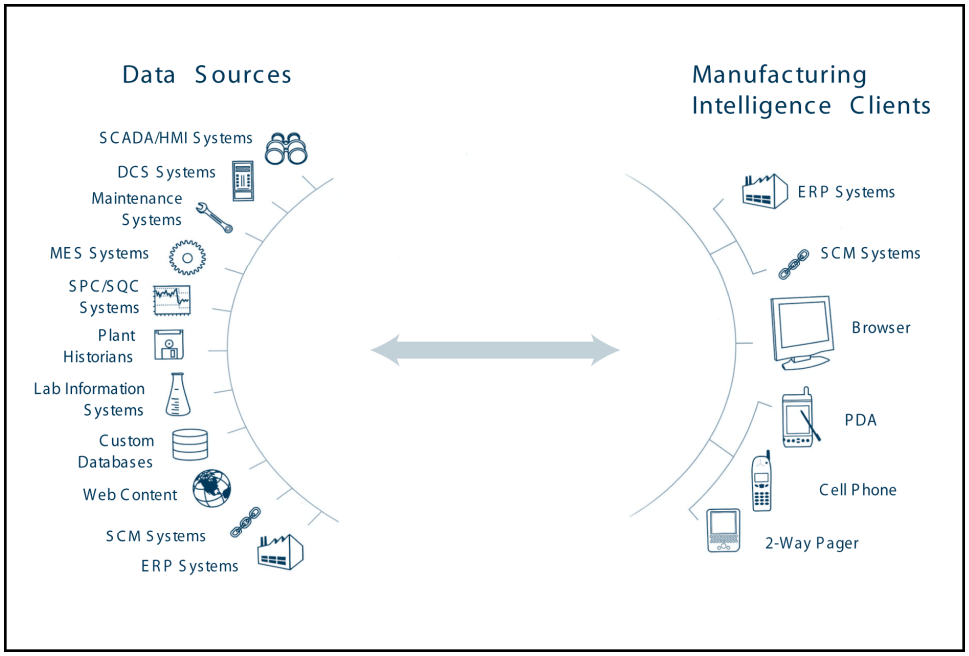
Data Sources

The hard part about incorporating production data into wider use is the problem of retrieving the specific required data and arranging the data in a context that supports a business process. Historically, this has been very difficult. Most information technology departments are not closely connected to plant operations or various MES components and have very little awareness of what data is available or how to retrieve it. A medium-sized facility could have sixty or more disparate components within their MES. Many of these applications very likely were built to specifications long since forgotten using technology that is no longer current. Documentation is frequently poor or nonexistent. Further, when the desired information has been determined and located, the cost and time to integrate the data sources on the plant floor have been prohibitive.

Many vendors are improving data accessibility in different ways. Many are moving to broaden their product/function footprint. Most have perceived the necessity of including a wider range of information in their systems, often with a particular emphasis on quality assurance, product lifecycle, and genealogy information. Other vendors are building extensive product offerings through acquisition, with the apparent plan to integrate this functionality into modular product suites. There are a few companies that are providing a fully integrated MES that includes modules for warehouse management, scheduling, product data management, process modules, maintenance and repair, quality management, and web services.

The Process Layer

One other idea gaining in popularity is the inclusion of a process layer that can easily link to data sources, retrieve specific data, perform process logic, and deliver an output. Manufacturing intelligence systems as supplied by Lighthammer Software are being applied in many industries to bring appropriate information into context for presentation and analysis.



These systems have the ability to extract real-time process information from plant-focused sources, aggregate the data from dissimilar sources into a meaningful context, and provide actionable intelligence. There is also a greatly expanded use of business process management (BPM) tools to retrieve information from disparate sources, redefine data context and logic, and provide aggregated data in other systems. One supplier includes a linkage capability that has been designed specifically as a business process management tool to implement process logic between new and legacy MES components. One example of this is to link quality assurance data with a supply chain event management system to monitor yield information and broadcast results to internal users. An additional step might be to provide that data to the planning and scheduling system in real-time for automatic rescheduling. To extend this further, we might inform downstream value chain partners of the quality assurance data, the resulting yield, the revised schedule, and current shipment information as developed in the logistics management system.

The change in manufacturing companies to collaborate more closely and to move toward a real-time information paradigm is revising the value proposition of MES. In previous times, applications were typically narrow in scope, thus making return-on-investment justification difficult. In tomorrow's manufacturing enterprise, MES intelligence will more directly support enterprise and value chain objectives aimed at inventory management, improved customer service, shorter process cycle times, true competitive advantages, improved profitability, and wider stakeholder success. Support for these higher level business processes is providing a new role for MES as a major source of enterprise intelligence, driving their current renaissance.

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