

Collaborative manufacturing: A strategy built on trust and cooperation

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With collaborative manufacturing, all parties in the business relationship contribute to the betterment of the whole.

Collaborative manufacturing is a different way of doing business. There are many facets to this strategy, but the most significant involves a change in business buy and sell roles: from adversarial relationships to cooperative, then collaborative arrangements, based on identified elements of mutual interest and trust. In a collaborative arrangement, participants contribute something for the betterment of the whole. As a result, the rules governing the relationship change, from those traditionally employed in business to ones based on mutual trust. These new rules are enhanced by performance and contribution.

Collaboration between companies is not a new idea. In its simplest sense, it is not much more than working closely together toward mutual objectives. A fair question might be: Can collaborative manufacturing be so simple as to be nothing more than sharing information? And, in some instances, the answer is yes. In fact, collaborative manufacturing can be defined as sharing information between business processes across internal or external partners in the value chain network.

Collaboration strategies

There are four basic types of collaborative manufacturing strategies: product lifecycle management, inventory/pro-

duction synchronization, distribution order fulfillment, and manufacturing enterprise collaboration. Let's now take a look at what each of these has to offer.

Product lifecycle management

The practice of sharing and collaborating on product design using supply chain partners is a significant management tool, especially in industries that use outside contract manufacturing facilities, as well as in those with multiple design engineering input locations (*See Fig.*). Included in this type of strategy is real-time information sharing on product tracking and product genealogy throughout the life of the product. This data could include: complete product design history, from initial concept to product disposal; quality assurance data; and use and repair information throughout the useful life of the product to disposal or recycle.

Inventory/production synchronization

In inventory/production synchronization applications, the intent is to synchronize inventories across supply chain partners. This means removing the inventory buffers that most companies put in place to protect their ability to provide products to customers when unanticipated adverse events impact the production plan. In addition, production plans are based on a demand forecast that is shared between supply chain partners as much as is practical and useful. Included in this strategy is the growing requirement for mass customization to meet

individual customer desires. Inventory management is a crucial element in accomplishing individualized unit production without a major adverse cost impact. The key to inventory management is to produce to actual, rather than anticipated or forecast, demand.

Distribution order fulfillment

The most successful implementation of collaboration to date appears to be Collaborative Planning, Forecasting, and Replenishment (CPFR)[®], a model developed by the Voluntary Interindustry Commerce Standards Association. The CPFR standard guidelines have been implemented by a number of companies building on earlier models of vendor managed inventory (VMI), an idea that has been very successfully implemented in retailing industries. Their success and the guidelines that have been published are very important, but are only a part of the process envisioned since the CPFR model stops with order affirmation. The inclusion of the CPFR model and collaborative relationships across the extended manufacturing enterprise, along with the use of real-time process information and the concept of a virtual inventory, all provide a broader view of the opportunities of collaboration in manufacturing.

Manufacturing enterprise collaboration

Sometimes it makes sense to share information, and this, too, is collaboration. As our information systems applications have matured, we have developed large silos of increased amounts of informa-

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tion that, in most cases, provide better resulting data. Unfortunately, we have constructed walls around and between business processes. In spite of the best intentions, these walls exist between departments within companies and between supply chain network partners.

In manufacturing enterprise collaboration the idea is to share information because it better supports the common everyday business processes that people work with as a matter of course. Historical efforts to tie systems together through tight integration have been very expensive, unreliable, time consuming to develop, and difficult to change once in place. Collaborative manufacturing methods use these systems as network nodes that are linked to retrieve or exchange information that can be interpreted and passed to interested parties and/or other systems.

One example is to link quality assurance data from within the manufacturing execution system with a supply chain event management system to monitor yield information and broadcast results to internal or external recipients. An additional step might be to provide that information to the planning and scheduling system for an automatic response to the actual yield quantity, and to revise the schedule accordingly. To further extend this, we might inform downstream partners of the quality assurance data, the resulting yield, the revised schedule, and current shipment information as developed in the logistics management system. One more step might be to advise the supply chain event management system of the new priority enhanced schedule by using a logic requiring notification by the MES if the revised schedule for the order does not begin on the date specified.

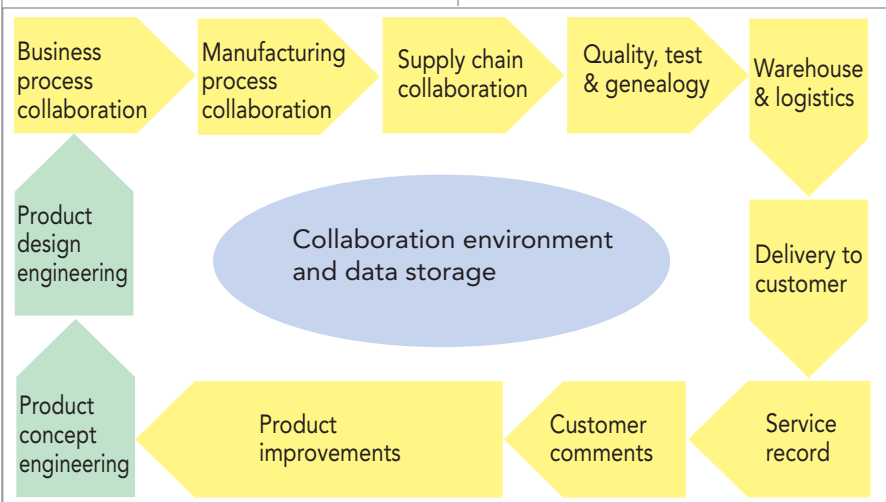
This type of collaboration may be as simple as information transfer through email to designated receivers and browser access, or as sophisticated as on-line

computer information sharing with internal and or external users.

At least two types of collaboration are aimed specifically at supply chain inventory management. Behind both synchronized inventories and CPFR collaboration is an intense focus on manufacturing products to an actual, as opposed to a forecast, demand. Although any production environment other than a build-to-order will have some degree of estimation, the idea is to eliminate as much of the guesswork as possible and use time buffers, not inventory buffers, to address any discrepancy.

first violinist, with each member using finely-honed skills (the real-time contribution) to provide the harmonious result. Everyone has his or her sheet of music (the demand forecast), understands his or her position in the orchestra (the supply chain), and produces in harmony (real-time synchronized result).

Supply chain management is the effort of continuously improving chain network partner performance. Collaborative manufacturing goes one step further to include supply chain partners in the virtual corporation as if they were part of the company. As a collaborative



With product lifecycle management, sharing and collaborating on product design using supply chain partners typically involves real-time information on product tracking and product genealogy throughout the life of the product. Data could include: complete product design history, from initial concept to product disposal; quality assurance data; and use and repair information throughout the useful life of the product to disposal or recycle.

This is best accomplished through a scheduling system that integrates each node of the supply chain into a single schedule, and provides actual demand information to each participant.

Islands of information must operate interdependently

To develop an effective collaborative manufacturing strategy, the supply chain network must be viewed in a holistic sense. The islands of information throughout the plant or plants of each supply chain partner should operate interdependently, similar to a finely tuned orchestra. Think of the conductor as the customer and the first violinist as the supply chain host. We key off of the

partner at any location in the supply chain network, the focus must be on the end customer. The commitment to, and the support of, meeting the customer needs as a supply chain network entity provides the collaborative advantage of the network. This applies whether the supply chain network is a group of non-related companies, plants of a multi-division corporation, or departments within a company.

Deployment

Collaboration can be a very effective and successful business strategy, but it is not easy or simple to implement, and will require new thinking, openness, and trust. Trust is the fundamental building

block of collaboration. Each partner must be able to share information without fear of being taken advantage of by the others. This includes such sensitive information as product design, cost information, and occasional performance deficiencies.

Other important considerations are:

- Only accurate, timely, available, and real-time information gives everyone the ability to react in the interest of the supply chain network.
- The purposes and objectives for collaboration should be consistent, and mutually aligned among all partners across the supply chain.
- There should be high visibility and accuracy of all data sources. Assumptions are unreliable and, therefore, unacceptable. Only accurate information allows trust.
- The old cliché still applies: A chain is only as strong as its weakest link. Reliability is a key factor in collaborative network performance and there is no substitute.
- To obtain reliability there must be a consistent allocation and commitment of resources.
- The ability to make delivery promises must be based on sound data and resource allocation.
- All partners must buy into the ideas, methods, and objectives.
- There must be a simple, well-defined data transfer methodology.
- There must be consistent and shared performance benchmarking standards that are measured and shared on a regular basis.
- Companies in a supply chain can hardly work at opposing ends. They must work together as an aligned team; they must collaborate.
- Chain partners must reduce or eliminate the adversarial tone among themselves. Supply chain partners must be seen as

departments of the extended enterprise with the common objective of enhanced supply chain performance.

- Using effective information technologies toward the focused objective is a must. The collective information management of the extended enterprise must be used.

Trust is seen as the fundamental element in collaborative relationships. In the manufacturing environment, trust comes from measuring and confirming events as they occur, and making this information available to partners. Whether this is called visibility or corroboration, having access to production information as manufacturing is occurring is a necessary exposure. Trust is then built on confirmation of events through information technologies.

Tactical applications

Tactical applications of collaboration are unfolding rapidly. Applications can be simple or complex,

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between two departments or any number of companies, or across the broader extended enterprise. Some initiatives are easily recognized, and allow quick implementation. Other initiatives are long range projects implemented through a team or teams of professionals over a period of years. Early projects aimed at obvious opportunities can be quickly brought on line with a very fast return on the investment. What follows is a list of tactical application ideas using collaboration tools for improvement.

- Initiate new product development efforts using a broader range of input and review from extended enterprise partners.
- Synchronize the inventory across the supply chain beginning with first tier suppliers.
- Provide schedule information to support producing to actual demand, not to an anticipated or assumed demand.
- Reduce the manufacturing cycle time for designated partners.
- Initiate a benchmarking performance review of the supply chain network.
- Examine how collaboration might be used to more closely align production with distribution channels.

Basic elements

Except in the simplest form, collaboration needs to have some foundation of formality. The following guidelines will help you begin the thought process as you define how your collaborative relationships will be developed.

- **Alignment:** Collaborative manufacturing requires companies to have mutually aligned interests. Collaboration is not about coercion. It is about sharing information and objectives in a way that the total is greater than the sum of the parts. Alignment helps to ensure that the people

understand the objectives and view the process alike.

- **Dedication:** Dedication to the ideas and objectives is a fundamental requirement of collaboration at any level. Whether the exchange is between departments or between companies, the commitment must be mutual and complete. Asset dedication, such as plant location or capacity set aside, is a part of the dedication. Collaboration cannot be business as usual.
- **Visibility:** The primary thrust behind collaboration is to raise the visibility of current and near-future conditions within all partners of the supply chain. For all the partners across the supply chain, this includes visibility of production data, logistics information, quality assurance and yield data, product development and enhancement, engineering change order issues, customer reorder or order changes, work-in-process status, genealogy information, granular inventory information, etc.
- **Accessibility:** Access to the data flowing within the collaborative system is a must. Some form of information systems integration among partners in the supply chain is absolutely crucial to ensure information is visible and consistent. The system must be able to support the objectives of the collaboration agreement.
- **Engagement:** Collaboration is not a one-time task or a business practice that you put in place and walk away from. Full engagement on a long-term basis is required to address marketplace and performance changes, and to continue building an evermore successful alliance. Collaboration is a process, not an event.
- **Online:** Online real-time information is the best source of data that is accurate, reliable, and available. Waiting for paper-borne information is not reliable or fast enough.
- **Network:** The supply chain is made up of a network of interrelated companies and interrelated functions. The relationship may be only for a single product for a single node of the supply chain, but the responsibility as a link in the chain represents the commitment to the network.
- **Security:** There has been a lot of comment made about sharing information and visibility across the supply chain network, but this is not about indiscriminate information access. Security is just as important here as it is in any other system.
- **Scalability:** Initial collaborative arrangements are likely to grow. As early systems are being considered, design into your process the ability to increase traffic and the number of participants.
- **Culture:** Collaboration efforts bring people closer together. Culture is a part of every group of people, and must be a consideration in the process of collaboration development.
- **Leadership:** There is an old axiom that business is not a democracy, and that is no less true today. Collaboration may be closer to democracy, but it is still business, and it requires strong leadership, not just good cheerleading. It is a business strategy that must be led effectively by the supply chain host, and accomplished with those qualified supply chain partners that share in the benefits.
- **People:** Collaboration is a people-centric concept. Bringing people closer together with the proper supporting tools to bridge business process gaps is the essence of collaborative strategies. Business processes provide the framework, and information technology is the enabler, but the applications must be people centric.

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To apply collaboration, begin by removing obstacles that stand in the way of cooperation from a small group (two to four) of supply chain partners. The process begins with steps that identify and set out the objectives of the arrangement. The second phase establishes the requirements, responsibilities, and methods of each partner in meeting the determined objectives. The third phase is the ensuring of compliance or the confirmation of facts based on absolute truth.

Collaboration: An evolution

Collaboration is an inevitable part of management techniques that are evolving to meet the needs of early implementations of broad multiple-partner collaborative strategies. Enabling technologies will continue to be developed to provide easier ways to connect across the supply chain network, and working together can produce better results for each participant. The time for the collaborative, real-time, extended enterprise as a competitive business unit is now, and implementations are increasing. ■■■

About the author

Michael McClellan is president of Collaboration Synergies Incorporated, a company specializing in consulting services aiding clients in the design and implementation of collaborative manufacturing and manufacturing execution systems. Prior to his current position, McClellan was president of a major supplier of material management and control systems. Before that he was a founder and president of Integrated Production Systems, a company that pioneered the development and implementation of computer systems for production execution.

McClellan is a member of the American Production and Inventory Control Society (APICS) (CPIM), and is a frequent speaker on

collaborative manufacturing and manufacturing execution systems. He holds one patent, and is the author of two books on manufacturing systems: Applying Manufacturing Execution Systems and Collaborative Manufacturing: Using Real-time Information to Support the Supply Chain.

The latter book describes collaborative manufacturing as a concept and outlines four strategic applications to support manufacturing across the extended enterprise. The primary ingredients of collaboration include the enterprise resource planning system, professional supply chain management and real-time online accurate information that describes and manages events as they occur within the extended enterprise. The book also describes the issues of truth and culture in collaborative arrangements, and provides examples of how collaboration is being used in various industries.

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