

Real-time enterprise solutions for discrete manufacturing and consumer goods

Andreas Renulf

Customer satisfaction and a focus on core competencies have dominated the thinking of a whole host of industries in recent years. However, one outcome, the outsourcing of non-core activities, has made the production of goods – from order entry to final delivery – more and more complex. Suppliers, subsuppliers, producers and customers are therefore busy adopting a new, more collaborative approach. This is mainly taking the form of order-driven planning and scheduling of production, but it is also being steered by a need to reduce inventories and working capital as well as a desire to increase throughput and optimize production.

The business and manufacturing processes that will succeed in the future must reflect and integrate both the value chain between the suppliers and customers, (ie from order entry to delivery) and the information channels from the plant floor to the business level.

Many manufacturers have begun to invest in Supply Chain Management Solutions in recent years, but the reality is that there is often a wide chasm separating the manufacturing and business processes in a company. The new step is for these companies to integrate supply chain management solutions and manufacturing processes to take full advantage of the optimized supply chain. ABB is addressing this development through an initiative it calls Collaborative Manufacturing

Management as well as real-time enterprise solutions offered by its Industrial IT architecture.

The need for real-time enterprise solutions

A recent report published by US-based ARC Advisory Group (see below)

underscores the gap between the ‘hoped for’ and the experienced benefits of supply chain software installations. According to ARC, some 48 percent are still not meeting customer expectations. In fact, many supply chain planning implementations are not producing anywhere near their full value because

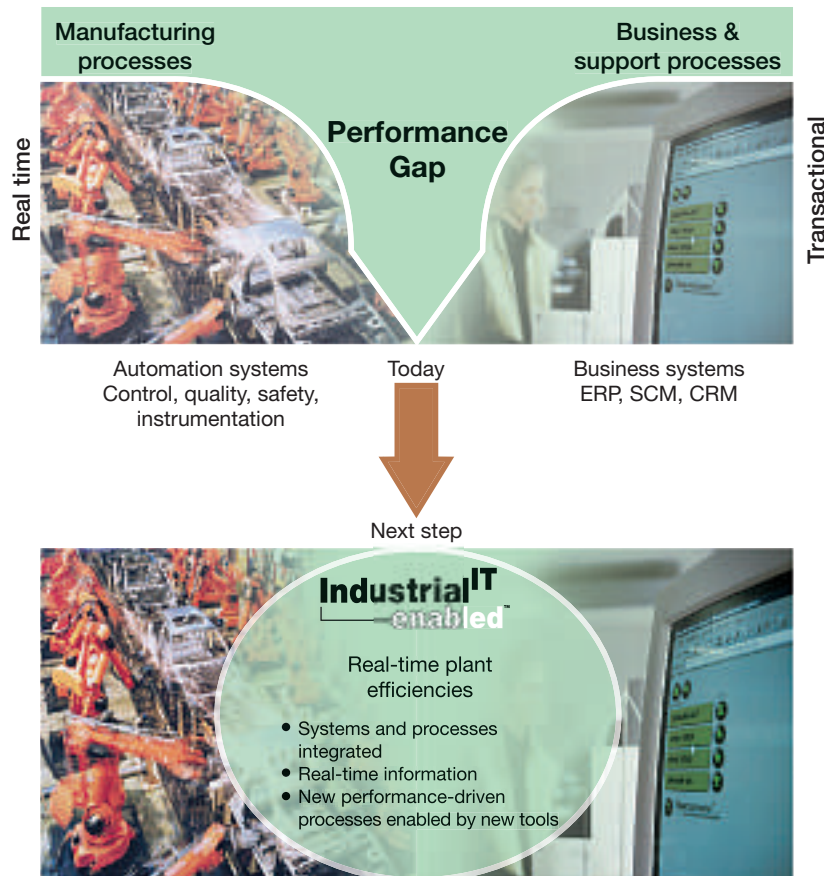
What ARC¹⁾ has to say about integrating supply chain management with manufacturing processes:

“... the marriage of supply chain and manufacturing systems is a key enabler for collaborative e-Manufacturing and supply chain optimization.”

¹⁾ Supply chain planning strategies, ARC Advisory Group Report, January 1999.

Many supply chain planning implementations are not producing anywhere near their full value because of poor integration of the manufacturing and business processes. ABB's Industrial IT architecture addresses this deficiency.

- ERP *Enterprise Resource Planning*
- SCM *Supply Chain Management*
- CRM *Customer Relationship Management*



(ie the manufactured products are highly modular) having the capability to *assemble to order* is highly attractive. The inventory level and the scrapped material will then both be substantially lower than if the products were manufactured to stock. But to be able to assemble to order, there has to be a supply chain in place that responds rapidly to customer orders and changes. To reduce inventory of incoming material, suppliers and subsuppliers have to be aware of order specifics earlier. Such a rapid and flexible supply chain requires a business process that is built around the customer order and has the ability to track and trace the order and the parts associated with it at every stage. In other words, there must be total control of the customer order throughout manufacturing. What is needed is a strong, real-time connection between the supply chain and the manufacturing process to allow for order changes and to have full control of the manufacturing process.

Something else driving the convergence of execution and planning is the need by many manufacturers to be able to tell customers at an early stage exactly when their goods will arrive. Robust Availability-to-Promise (ATP), Capability-to-Promise (CTP) and Profitability-to-Promise (PTP) applications will require integration of planning and execution applications, but the execution components will be the true drivers of robust functionality. ARC believes that this will become a major Supply Chain Management (SCM) growth area.

Most companies put a high value on product quality. So much so in fact that

of *poor integration*. This is cited in ARC's user survey as the key source of disappointment.

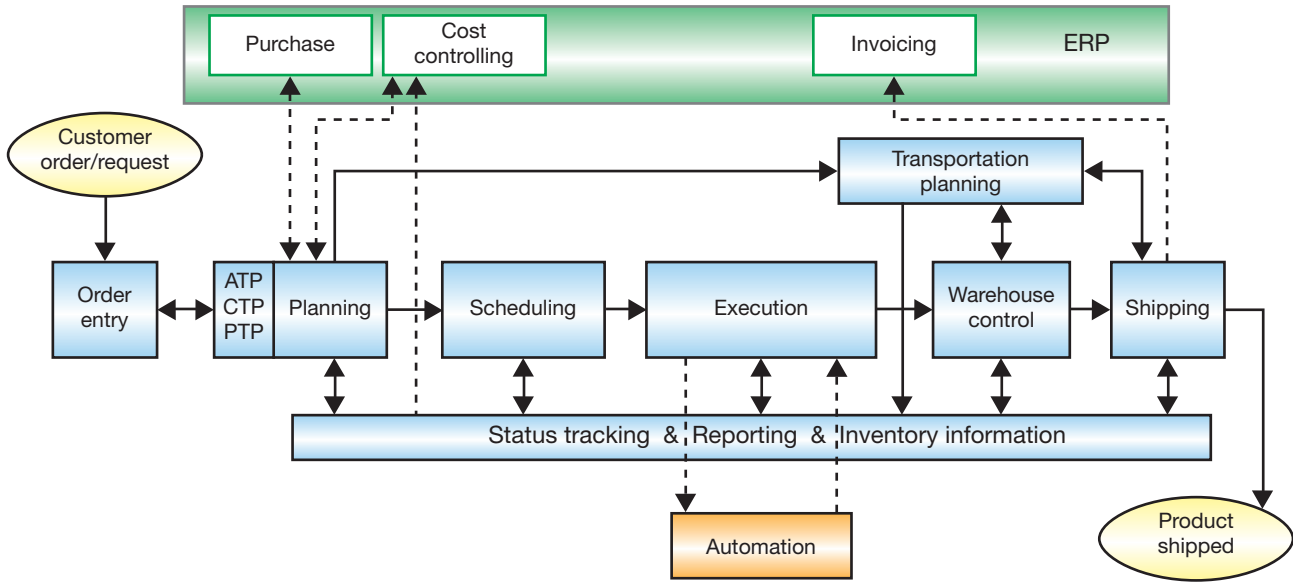
The nature of the real-time enterprise solution will obviously depend on which business criteria apply in practice. Most companies are experiencing pressure on prices in their markets; cost-efficiency is therefore paramount, but pressure is also put on management to improve the cash flow. In such a scenario, a lot of attention is given to inventory levels and turns. This is because the size of the inventory

is a useful measure of efficiency in the supply chain. To reduce inventory levels and speed up inventory turns, which has a positive cash effect and also improves manufacturing efficiency and quality, real-time linkage of manufacturing processes and the supply chain process is a must. It puts the management team in full control of the manufacturing process and allows it to instantly communicate planning changes to suppliers and subsuppliers.

If the business is mass customized

Real-time order fulfillment: Example of a real-time enterprise solution, beginning with a customer order and ending with the product shipped

- ATP *Availability to Promise*
- CTP *Capability to Promise*
- PTP *Profitability to Promise*



critical components are often ordered from several suppliers to provide an option in the event of quality problems. But to be able to address quality problems effectively, companies need a link between the quality control processes incorporated in manufacturing and the suppliers and subsuppliers, as well as a direct link to specific orders. The quicker information is transmitted from the producer to suppliers and subsuppliers, the more time there is to respond and re-plan. For products with a short cycle time, it makes good business sense to transfer real-time information from the quality process as soon as quality problems occur. In order to re-plan and reschedule manufacturing, this information has to be transmitted in real time to suppliers, subsuppliers and the sales department.

Product cycle time (ie the time that elapses between products being ordered

and being delivered) is an important business criterion for many manufacturing companies. Here, real-time enterprise solutions can make an important contribution. The computer industry, where producers can charge more for PCs if the customer wants them delivered in a shorter time than usual, is just one of the industries that benefit from such solutions being integrated into the supply chain management. To be able to re-plan and reschedule manufacturing on the basis of customer orders with delivery priorities, companies require a flexible supply chain and total control of all aspects of the manufacturing process. Having access to real-time information from all the manufacturing stages, beginning with incoming parts, makes it easier to assign a higher cycle time priority to a specific customer order and run it through the manufacturing process faster. Planning and

scheduling can be done on-line in real time, instead of batch-wise.

Real-time enterprise solutions from ABB

For a better idea of how all this works, imagine a plant where the inventory level is optimized to cover just 4–5 hours of production – a standard situation today in the electronics or automotive industry.

A key role is played in this scenario by the solution chosen for maintenance of the production equipment at the supplier's end. If production stops for any reason, the supplier will have only 4–5 hours to correct the problem before the producer has to stop his machines, possibly resulting in costly penalties. The supplier's preventive maintenance strategy – as a means of preventing production stops in the first place – is also extremely important here, especially considering



the time it can take to get depleted inventories back up to the required level.

The solution here has to include real-time connection to production equipment and an alarm function that instantly informs about production stops and their cause. This gives a supplier the maximum amount of time and the freedom needed to respond effectively to a production stop. And the solution should include a maintenance plan for all the production equipment. This may be based, for example, on information about the operating performance of robots on a production line, extracted from the robot software.

Real-time execution is another solution that allows inventory levels at the supplier's end of the supplier-producer chain to be kept low. As long as production of the end-product goes according to plan, there is no problem. However, if the end-customer changes his order, the producer will pass on the change to the supplier, who will be expected to react quickly and fulfill his new obligations.

A real-time execution solution ensures that any change in the production plan is realized in the production process. A real-time availability check is carried out on the parts involved, the materials are ordered, and the order is included in

production scheduling. Giving different priorities to the customer orders allows the production planning and scheduling to be changed on line when a real-time connection exists between them. The benefit is that a preferred-customer order, for which a higher price may be asked, can be processed faster than would normally be the case.

Another, this time 'niche', solution that falls under the 'enterprise optimization' label, is rack management. In automotive manufacturing, the racks used to transport parts from Tier 1 suppliers to the automaker are concentrated in two areas of production: in the body shop, where parts from the press shop arrive on racks for welding by robots, and in the final assembly shop, where the racks carry insulation and plastic parts like fenders and panels. The racks are custom made for the model being produced, and, as they are usually expensive, available in only limited numbers.

At present, most automakers have no system in place to tell them where the racks are located at any given time; neither do the Tier 1 suppliers incorporate the racks in their production planning. Problems can therefore arise when, for example, production stops in a manufacturing plant and the Tier 1 supplier keeps sending

racks with parts to that plant without getting racks back. In time, the Tier 1 supplier runs out of racks for parts for other plants and has to either cease production until racks become available, or continue producing and repackage the parts when the racks arrive. In either case, the cost to the Tier 1 supplier can be huge.

A rack management solution that addresses these problems includes a track function that tells the Tier 1 supplier exactly where his racks are at all times, and a planning function for optimal planning of rack utilization. A solution incorporating these two functions makes it possible to avoid the problems that can arise when production stops at an automaker. For an even more sophisticated solution, rack planning can be integrated with the material, people and machine availability in the general Tier 1 production planning to make it more accurate.

A 'virtual' factory with real benefits

ABB is currently implementing a real-time enterprise solution with the long-term goal of having orders from regional sales automatically brokered to the best-suited plant, where they are automatically slotted into the production schedule

and their execution is tracked and made visible in real time.

Incoming regional orders are consolidated and allocated to one of the manufacturing sites on the basis of competency, regional coverage and present-time capabilities. Local order execution is based on close integration of business processes and supporting IT applications, eg an advanced planning system and linkage through SKYVA, Bill of Material management and order fulfillment in SAP, and plant floor tool management and optimization with ABB Operate^{IT}.

The business benefits of similar projects show that factories can be optimized to obtain one global 'virtual factory' for better capacity utilization, lower inventories and shorter cycle times. An additional benefit is that the sales process becomes more competitive in terms of responsiveness based on advanced planning and ATP delivery.

Similar solutions are available to Tier 1 suppliers in the automotive industry. Consider, for example, the cost benefit to a Tier 1 supplier able to shift much of its manufacturing to factories where production is cheaper.

All of these benefits come from having an optimized supply chain with real-time connection to all the different manufacturing steps, telling the manufacturer exactly what the factory is able to deliver at any given point in time.

ABB – a real-time enterprise solution provider

ABB is one of the world's largest providers of automation systems to the manufacturing and consumer industries and is focusing its efforts in the area of enterprise optimization through a unit named Enterprise Solutions Group. The charter for the Enterprise Solutions Group is to bring enterprise optimization solutions to the automotive, discrete manufacturing and consumer goods industries.

Six core areas need to function optimally for a company to fully benefit from enterprise optimization solutions:

- Production logistics, including cycle times and quality assurance processes
- Strategic sourcing and procurement, including supplier performance and supplier quality management
- Supply and demand planning, including process optimization
- Transportation management
- Warehouse management
- Customer order fulfillment and customer service

Production logistics, transportation management and warehouse management are business focuses of ABB's Industries Division. In the areas of strategic sourcing and procurement, supply and demand planning, and customer order fulfillment and customer service, we have invested heavily in recent years and implemented solutions

to optimize our own company. We also have management and process consultants working for us, externally as well as internally, in the mentioned six core areas. With this infrastructure in place, ABB is well positioned to offer enterprise optimization solutions to the automotive, discrete manufacturing and consumer goods industries.

ABB also has three important assets that guarantee a successful outcome for enterprise optimization projects in which it is a partner. One is our reputation for never walking away from a project. We stay until the customer is happy. Second, we are used to handling real-time information – the key ingredient in enterprise optimization – in automation projects across the discrete manufacturing and consumer goods spectrum. And third is ABB's Industrial IT initiative [1], in which enterprise optimization solutions play a key part. This new platform will change the way industries do business in the future.

Author

Andreas Renulf

ABB Industries
Badenerstraße 780
CH-8037 Zurich
Switzerland
andreas.renulf@ch.abb.com

Reference

[1] The ABCs of Industrial IT. ABB Review 1/2002, 6–13.