# Better together

## The value of transforming data into actionable intelligence

SIMO SÄYNEVIRTA, MARC LEROUX – Since the early 1990s, manufacturers and vendors of automation or manufacturing software have been talking about the value of moving from "islands of information" to a collaborative model in which the right information is available to the right person, at the right time. Latterly, it was recognized that data, out of context, was just data, so an additional axiom was added: with the right context. What is needed is actionable intelligence – data with the proper context applied to it and data that includes operational experience. While progress has been made to help manufacturers move in this direction, the reality is that many are still in a position similar to that of three decades ago. What is the situation in manufacturing today? How will things develop? And what products are available that can be used by a manufacturer as building blocks in a true collaborative environment?

The systems should collaborate and determine the solution that is best for the business – this changes the focus from production-based to profitability-based manufacturing.

Today, the typical manufacturer has between 20 and 40 information systems in any given facility. Despite good intentions, these largely exist as “data islands” and, because of historical difficulty in integrating these islands, decisions are often based on only the most immediately relevant system, with scant regard for the overall business picture. Enterprise resource planning (ERP) systems have long held out the promise of improving this situation, but the reality is that there is a significant difference between making a business decision and implementing it in real-time manufacturing operations. Also, while ERP systems are very good at ensuring business rules are followed, they typically work on data that is periodically consolidated, which, by definition, is not current.

**Title picture**
How do ABB solutions help customers turn production data into value for the enterprise?

Another favorite focus area is process improvement. But improvements are often too narrowly targeted and fail to take account of impact on the entire supply chain. Broadening scrutiny to cover topics like product consistency improvement can reduce both raw material and finished goods inventories, lower transportation costs and improve cash flow. This can have a tremendous impact on the net profitability of a company, but this impact can only be properly assessed if all the relevant subsystems collaborate.

What is needed, then, is a true collaborative model. The good news is that technology has now caught up with the requirements: Collaboration between systems is no longer prohibitively expensive, or limited in functionality. And such collaboration is already having a big impact on major companies today.

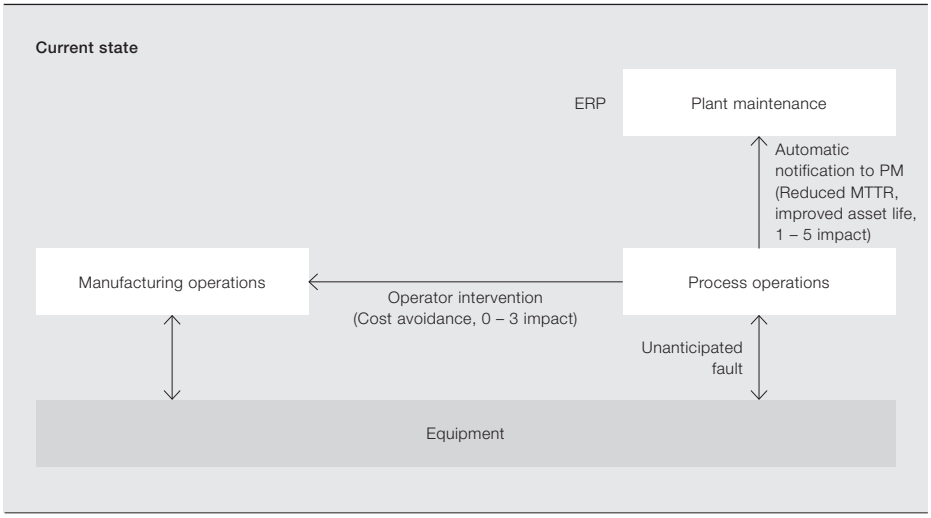
## Together, but apart

Often, production equipment will fail. Usually, the operator will call maintenance, who will then assess the situation, order parts, schedule the work, inform the supervisor, and so on. This is a very time-intensive process, with actions recorded electronically, typically after the fact → 1.

Alternatively, the equipment could detect the fault automatically and notify the operator and others. All pertinent information would be acquired by the computer maintenance management system (CMMS), which would then automatically check resources and parts inventories and notify the operations and production planning systems. Many companies have this today → 2. (Asset Optimization for Extended Automation System 800xA, for example, is an ABB offering, that provides this functionality.)

The next step is to have the systems collaborate and determine the solution that minimizes the cost to the business. This changes the focus from production-based to profitability-based manufacturing. At this point, the decision that is best for the whole business, rather than for a subset of it, can be made.

1 Processes can be very time-intensive when systems are not integrated into a collaborative structure.




Many executives would believe that this is where they are today, or where they have been since they invested in an ERP system. A common belief is that all aspects of the organization are integrated by the ERP system. Unfortunately, this is far from the truth. While tremendous cost reductions can be realized through the installation of an ERP system, much savings potential remains. The good news is that the infrastructure is in place. The current vision just needs to be extended.

## Integrated, but not

Each entity inside an ERP implementation may have access to the same data, but each tends to focus on its own interests, to the detriment of the whole: Maintenance will focus on work orders and spare parts inventory, production planning will focus on optimizing the planned manufacturing process, and the customer-facing part will focus on customer orders and receivables.

One of the primary reasons for this is the still very limited communication between the corporate/ERP level and the manufacturing systems. This is perpetuated by the belief of manufacturers, and IT personnel, in the segmentation of manufacturing layers. This attitude is even enshrined in the de facto standard for integration of manufacturing and business systems (ISA-95/EC 62264 Enterprise to Control System Integration) → 3.

Such boundaries need to be eliminated and manufacturing has to be treated as a component within an overall enterprise system.

## Interfacing vs. integration

For a collaborative manufacturing system, it is essential to differentiate between interfacing and integration:

– Interfacing: Replication of data between one system and another. The result is data that exists in multiple systems. The transferred data may, or may not, have context, or meaning, applied to it.
– Integration: Data is referenced between systems through a model that automatically applies context, ensuring that the system referencing the data knows that it is up to date and that it is being referenced in the proper context.

Integration addresses two fundamental principles of computer systems:

– Data without context is data. Data with context is information.
– If the same representation of data in multiple systems is different, then both are wrong.

Data originates at the device level and is used at the automation level. This data is captured and stored in high resolution and is visible at the manufacturing level in the collaborative production management (CPM) system, where models can be applied and an integration framework exists for seamlessly integrating information between systems.

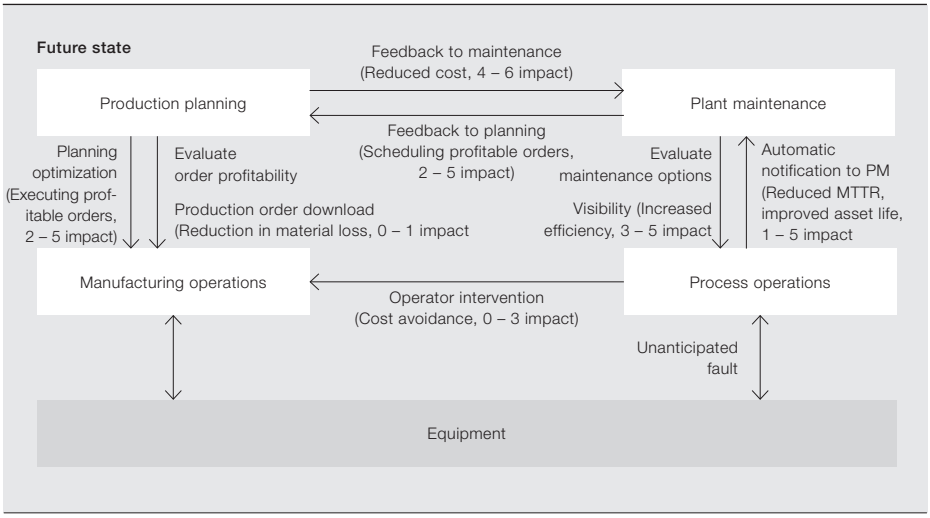
## Collaboration – business benefits

Many trends are driving the need for an improved collaborative approach. For instance, the increasing number of aging workers who are retiring and taking their long years of experience with them. There is also recent economic uncertainty and the drive to meet shareholder expectations. These have caused some organizations to switch to off-shore production in a bid to cut costs. This may lead to decreased operational efficiencies due to organizational knowledge being lost, company culture not being understood or much higher employee turnover rates. A further, and very relevant, trend is company growth through acquisition. Major challenges here are the alignment of diverse computer systems, product line rationalization and the shutting down of production lines or facilities deemed to be underperforming.

> Manufacturing and engineering staff can be located where they are the most effective – if there is real-time access to data, monitoring and control.

The key to overcoming these challenges is a re-evaluation of the overall manufacturing process structure, taking each facility not as a standalone entity, but as a part of the whole. This leads to an

2 Collaborative organizations function much more smoothly (relative impact).




integrated manufacturing environment that facilitates a collaborative manufacturing process. For example, with fewer technical resources on-site, manufacturing problems can be addressed by a team of experts located in geographically different locations.

As in IT outsourcing, manufacturing and engineering staff can be located where they are the most effective. For this to work, there must be real-time access to manufacturing information and events and the ability to monitor and control the operations remotely, as well as collaboration between systems. This becomes much more important as geographically disparate sites become part of a virtual organization.

## Collaboration – becoming a necessity

In some fields, a collaborative mode of working is inescapable. New oil and gas finds are now usually in geographically remote, harsh environments. This presents a dual challenge: Putting experts on-site is logistically difficult and expensive, and, at the same time, the harsh conditions make operational problems difficult to resolve. To solve this, real-time sensor data and related analytics must be made available remotely, in a secure way, so they can be accessed by the key experts, wherever they are in the world.

For example, in the oil and gas industry, this approach is supported by ABB's integrated operations (IO). Their solutions include secure, high-speed data collection and storage, remote asset diagnostics, remote control rooms providing collaborative automation, and advanced process control solutions. For example, the optimization of production on an oil platform in the North Sea can be managed from a control room in India.

Similarly, in the mining industry, ABB's MineMarket and Ellipse collaborative production management solutions, together with System 800xA automation platform, manage all the aspects of integrated mining operations, from the mine face to the port. The functions include operations planning, execution of the production processes, tracking material flows and product quality through the entire supply chain, and asset management. Information is coordinated through the collaborative production management infrastructure.

Each facility is not considered to be a standalone entity, but a part of the whole.

## Changing business paradigms

A collaborative manufacturing environment can completely change the rules of the game. Take, for instance, the cost of energy in energy-intensive manufacturing processes. This has traditionally been treated as a fixed cost that cannot be influenced. This is rapidly changing. In many countries, the electricity markets

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3 Even standard models of enterprises have a boundary between level 3 (manufacturing) and level 4 (enterprise).

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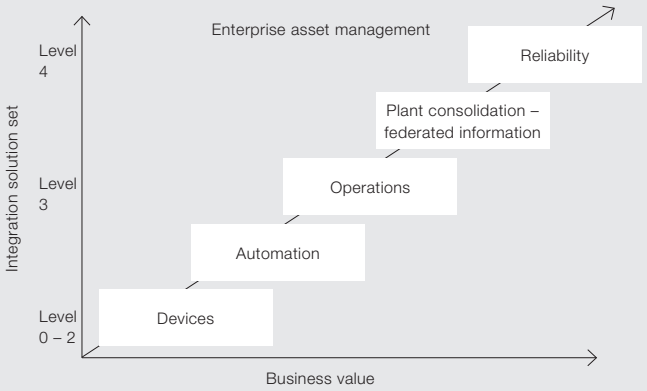
|---|---|---|
| Level 4 | **Business planning and logistics** Production scheduling, business management, etc. | Establishing the basic plant schedule – production, material use, delivery, and shipping. Determining inventory levels. |
| Level 3 | **Manufacturing operations** Dispatching production, detailed production scheduling, reliability etc. | Workflow / recipe control to produce the desired end products. Maintaining records and optimizing the production process. |
| Level 2 | **Manufacturing control** Basic control, supervisory control, process sensing, process manipulation | Monitoring, supervisory control and automated control of the production process |
| Level 1 | | Sensing and manipulating the production process |
| Level 0 | | The physical production process |

4 ABB has a comprehensive service strategy.




A key aspect of manufacturing that will see a dramatic change with the advent of collaborative systems is service.

have been deregulated, allowing manufacturers to become active market participants, buying and selling electricity at the hourly market price. Even if the supply of electricity is secured by long-term contracts, the actual opportunity cost of manufacturing operations is now no longer a static variable.

This complexity can be turned into a business opportunity. As one example, ABB's cpmPlus Energy Manager allows manufacturers to plan, monitor and optimize their energy operations together with their manufacturing dynamics, in real time. In addition to obtaining optimal energy rates, and avoiding penalty conditions, the product can inform manufacturers when it makes more sense for the overall business to shift production to off-peak energy periods or to slow down or stop it altogether and sell the saved electricity to the grid for a profit.

## The future of service

A key aspect of manufacturing that will see a dramatic change with the advent of collaborative systems is service → 4. Traditional service roles will become blurred as assets now have the ability to monitor their own health, and to automatically report any exceptions before failure. This increases profitability by reducing production downtime and increasing asset life. In a complex operation, small inefficiencies – a sticky valve for example – can have a huge ripple effect throughout the entire operation, and as process instability sets in, the root-cause becomes obscure.

Over the past decade many established manufacturers have recognized that maintenance is not a core competency. This has driven companies like ABB to increase their service portfolios to include:

- Maintenance services: keeping assets operating at peak levels
- Reliability services: understanding the projected reliability, risk and cost of failures.
- Performance services: understanding the impact of changes on an asset's performance and providing the expert services to retune the process.

All three of the above must operate in a controlled and collaborative fashion to optimize overall performance and profitability. ABB has recognized this, and has developed a comprehensive service strategy that extends from device status through to a complete asset health, reliability and maintenance solution. Central to this is a collaborative environment that facilitates the interaction between systems.

## Barriers to adoption

Fundamentally, most of the topics mentioned so far are not new, yet they are still central themes in manufacturing conferences and industry analyst reports. Some reasons why they have not yet become reality are:

- The "we already have it" attitude. Manufacturing executives have heard the claims that their multimillion dollar ERP investment includes this integration and they question the need for further investment.
- Organizational silos: Planning, operations, customer service, maintenance and IT, as examples, are all independent silos with their own objectives and metrics. Often the

5 The right information available to the right person, at the right time, with the right context

metrics are contradictory: Maintenance will always take the lowest cost approach if they are being measured on maintenance cost only, not on the complete organizational performance.
– Security: One of the chief roles of IT today is to maintain the integrity of data. The easiest way to do this is to limit the interactions between systems, rather than promote the collaborative integrated scenario.
– Sunk costs: Often, investments do not yield all the expected benefits. There can be reluctance to commit more funds for incremental improvements to realize these missing benefits as they are regarded as having already been paid for. This is particularly true with software projects as they often have intangible benefits, or have already experienced unrealized expectations and cost overruns.

These issues can all be effectively addressed, but the key is that organizations must first understand that they exist.

## How to get there?

Technology is just an enabler; investments in technology will not, by themselves, translate into value. Further, having a multiyear improvement plan can become a liability. It is often better to have a five-year plan where one is always at year one and, as new factors are incorporated, opportunities and results are re-evaluated. This means that companies can stop focusing on sunk costs and look at the incremental value that change brings.

A key action of this strategy is to drive business value to all levels of an organization. Every decision, from the operator level to the senior management, should be based on its value to the business. This brings one back to the collaborative environment: Seamless access to information allows operational decisions that factor in customer requirements, quality, asset condition and cost to provide an optimal recommendation. Data from multiple systems must be consolidated to provide a picture that focuses on business objectives and drives business value.

> The good news is that the infrastructure is in place. The current vision just needs to be extended.

A prerequisite for this is quality industrial software that has been developed with integration in mind. An architecture that is designed to seamlessly integrate with other systems, collect information at high resolution from underlying decisions and store it so it can be quickly retrieved and visualized is key. ABB has this today with Collaborative Production Management platform cpmPlus, and the industrial software applications built on it.

The underlying automation also needs to be designed to take advantage of this integration. This is the case with ABB's flagship automation systems, Symphony Plus and System 800xA, as well as with the underlying sensors and devices.

And the solutions must extend up to the enterprise level to include operations, reliability and enterprise asset management (EAM) products. ABB has this today in its vertical industry offerings and Ventyx enterprise solutions.

Finally, all of this needs to be tied together by services carried out by people who understand the domain and who know how to utilize the technology and solutions to drive operational excellence and business value. ABB has service and consulting resources that do this every day.

ABB has the technology, the products, and the services to implement a collaborative manufacturing system. All the components are in place. The last action is to work toward this goal together, manufacturer and supplier, in a collaborative fashion → 5.

**Simo Säynevirta**
ABB Collaborative Production Management
Helsinki, Finland
simo.saynevirta@fi.abb.com

**Marc Leroux**
ABB Collaborative Production Management
Westerville, OH, United States
marc.leroux@us.abb.com