

Digital Transformation with Vertical Integration: an Expert's Perspective

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As a trusted expert in his field, Norbert Meierhoefer has over 20 years' experience in business consulting with a focus in manufacturing execution systems. Based in Germany, Norbert is intimately familiar with the Industrie 4.0 movement from its nascent start into its current world-wide focus as digital transformation. He has helped dozens of clients improve business results by streamlining processes using software and change management.

Digital transformation seeks to use technology to achieve your goals: fewer errors, more production, better product quality and improved customer service. The vertical integration of enterprise and IT technologies — also known as “smart manufacturing” or Industry 4.0 — synchronizes commercial systems, such as production orders from the enterprise resource planning system, with manufacturing systems like the distributed control systems, weigh scales or barcode readers. Learn how you how can reduce product quality errors, batch cycle times and operating costs through vertical integration.



What is vertical integration? Why is it so important today?

The power of enterprise resource planning (ERP) systems and plant automation are both well-known. Global adoption of these technologies is quite high: In other words, the majority of specialty chemicals and pharmaceuticals manufacturers around the world have invested in ERP and/or distributed control systems (DCS).

However, in my experience there is a significant gap between these two systems. For example, the ERP receives an order from a customer then checks available inventory; that demand is visible to the production scheduler or operations – all automatically. These processes are very helpful and efficiently allow the commercial side of the business to operate smoothly. Similarly, on the manufacturing side, plant automation allows digital control of the plant assets to maintain quality, verify raw materials and more.

That said, these days most people realize the potential data and new automation systems have to further streamline operations. Some call this Industry 4.0, smart manufacturing, digital transformation or digitalization; there are many terms. To realize the potential benefits, we need to link – or vertically integrate – the commercial and manufacturing systems. They are indeed powerful independently, but a huge gulf exists between them. To truly use all the data collected, we must connect the systems to allow even more automation and provide context for the data, enabling advanced analytics. My opinion, which may be an unpopular one, is that you cannot truly analyze your data until this context is applied.

Isn't ERP software adequate to enable big data?

ERP software is good for many things – invoicing, order management, accounts receivable, inventory analysis, financial reporting, audit preparation, quality documentation, automatically generating certificates of analysis, being a system of record and more. However, ERPs usually do not understand the batch-specific parameters or situations that happened during a production campaign. Consider an example: if a plant's automated barcode scanner and weigh scales were integrated with the ERP, they could automatically track the lot of raw material and deduct the weight from inventory. The lot of raw material would then be linked to that batch of product, enabling product genealogy painlessly.

So then what are the benefits of vertical integration?

Integrating the commercial and manufacturing processes delivers compelling results, namely: reducing operating expenses (OPEX), improving product quality, reducing batch cycle time (increasing throughput) and finally, enabling digital transformation. If you truly have efforts focused on digital transformation, this data context can ensure you succeed in those projects.

For example, vertical integration can save time on batch processing. If a shift supervisor must approve certain measurements fall within tolerance, this can be done from his or her desk, eliminating the need to walk somewhere else in the plant to manually initial or sign a production logbook. Vertical integration can also document production deviations, including comments from operations and pertinent process data. Once this is documented, the system triggers additional approval in different groups in the facility, such as the production manager or quality control manager.

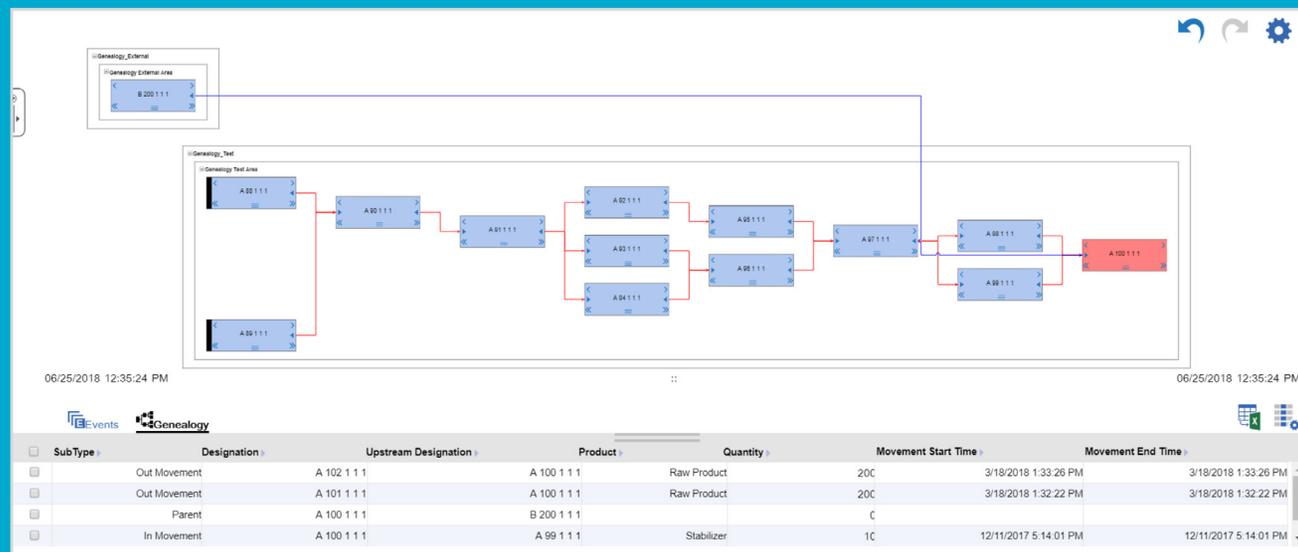
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You mentioned product genealogy. Can you say a bit more about that?

Sure. At the most basic level, product genealogy tracks how your products are made, then follows them through your organization and beyond – all the way to your customer. For every product you will be able to track essentially anything you would like to know:

- all the consumed raw materials
- the suppliers and lot numbers for those raw materials
- the quality of those raw materials
- the people who worked on the product and when they worked on it
- the shift supervisor who approved any results
- the equipment that was used to manufacture the product
- lot numbers
- equipment serial numbers
- measurement data that was acquired from the plant
- if there was any rework...

Once you have that data it can be used in many ways, such as product quality verification, environmental stewardship, managing product recalls if that unfortunate situation arises, or for various trade certifications such as “Fair Trade” or “Certified Organic.” Product genealogy is imperative for pharmaceuticals as well as many other industries. For example, one rubber customer in the United States told us there is legislation called the Transportation Recall Enhancement, Accountability and Documentation (TREAD) Act that requires tire and automobile manufacturers to be able to easily find and recall defective tires by matching the tire to the automobile’s VIN number.



Product genealogy, shown here in AspenONE Process Explorer™, allows visualization of the source of raw materials used in every batch.

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How do you map the savings and results of a vertical integration project?

First, I would suggest trying to understand the value before starting the project. Many clients I have worked with understood the value before starting; this is a pattern I see for successful projects.

That said, our industries are reaching a tipping point where vertical integration is becoming a very profitable, almost obvious investment, like the early days of DCS replacing pneumatic controls. At first everyone wanted to do specific calculations and justify the investment, but later companies realized it was such a worthwhile investment that they should just add the DCS as fast as possible. Vertical integration can improve outcomes for almost any performance area you are measuring.

You can use many of your existing KPIs to get started. Consider some of these questions:

- How often did we miss quality standards due to errors on the shop floor?
- What data do we lack that could have provided valuable insight?
- How is our cycle time varying? What would be the benefit of cycle time reduction?
- Do we need more product? If so, what are the current bottlenecks?
- How well do we meet customer delivery targets?
- How well do we meet our schedule and plan targets?



What are the prerequisites for implementing vertical integration?

On the manufacturing side, there are almost no prerequisites other than well-known standard operating procedures (SOPs). There are no required automation systems, it's possible to begin with an entirely manual process. The commercial side requires an ERP, which most companies have at this point.

Also, AspenTech's vertical integration solution is extremely flexible and designed to work with other solutions. For example, Aspen is DCS hardware- and software-agnostic and certified to integrate with SAP.

What do you recommend as the first step?

This will be different for everyone. I would typically recommend that we schedule a face-to-face meeting to review your requirements and objectives, as well as your existing solutions and processes. From there we can schedule a follow-up to make a proposal, bring in partners and execute.

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