No Matter What You Call It: Industry 4.0 Means Manufacturing in Transition

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INDUSTRY 4.0 MEANS MANUFACTURING IN TRANSITION

CALL IT WHAT YOU WANT BUT MANUFACTURING IS IN TRANSITION

Whether called Industry 4.0, Industrie 4.0, Smart Manufacturing or even China 2025, the basic idea is the same: The entire manufacturing value chain is experiencing a technology-driven transition in terms of capabilities and expectations.

It is not simply about replacing people with machines, but instead about how people, interconnected sensors, machines and artificial intelligence can work together more effectively.

The transition is not revolutionary in terms of the goals and aspirations of manufacturers. Manufacturers remain motivated to increase productivity, deliver quality products, delighting customers and achieving greater profitability and sustainability.

What makes this transition distinct are unprecedented technological capabilities that potentially impact all aspects of manufacturing execution.

The Industry 4.0 driven process change to execution will impact manufacturing at the individual operation level. These digitally-driven capabilities promise to impact manufacturing across industries and the supply chain. **That means that to remain competitive, manufacturers should plan to adopt new technologies rapidly.**

CATALYSTS OF THE TRANSITION

There are several key catalysts driving this Industry 4.0 transition in manufacturing:

Pervasive connectivity – connectivity has permeated everything. It redefines the notion of interoperability. Once siloed systems are now connected making the sharing of data a foundation for Industry 4.0 in much the same way the internet became a backbone for a transformation in the way businesses deliver goods and services.

Smart sensors and enabled data sources – affordable sensor technology has enabled access to data at the atomic level of devices via the Industrial **Internet of Things (IIoT)**, not just for raw data but increasingly and for intelligent messaging and services.

For example, a smart sensor in a cold chain could send a warning alert when a food item exceeds the desired temperature. It could then send a follow-up alert indicating the food item is no longer viable because the temperature exceeded the maximum for a specified amount of time. In contrast, a traditional, non-smart sensor would send all temperature readings on a constant basis with no suggested action. Data that was once too expensive to capture can now be economically gathered and used to make better, data driven decisions.

Advanced analytics and big data storage – traditional business intelligence and data warehousing are transitioning to richer visual and collaborative predictive analytics models that tap into more dynamic, real time and non-explicitly related data. Advanced analytics can answer critical questions even sometimes before they are asked. For example, using machine learning, machine yields could be compared and optimized. Leveraging supplier item information, the system could determine if supplier product quality may be a significant factor. These could be done without explicitly running an analysis of supplier parts or machine yield.

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Accelerated and advanced computing – raw computing power continues to move at blinding speed with cloud and edge computing blurring scale and capacity into what seems potentially like an unlimited resource.

CATALYSTS TURN INTO CAPABILITIES

In many cases, the effects of Industry 4.0 combine one or more of these catalysts into new, innovate capabilities.

Artificial Intelligence (AI) is already transitioning from an academic exercise to an impactful business proposition. The practical adoption of AI through machine learning results directly from enhanced connectivity, smarter sensors, advanced analytics and super scalable systems

AI is becoming a proactive element to advanced manufacturing, product life cycle management and enterprise asset management. It proactivity is based on context and what it has learned, not simply based on established metrics such as performing preventative maintained based on accumulated run time or placing an order based on a predefined reorder point.

Today we need to know the questions we want to ask a system. Tomorrow, AI can tell us the questions we should be asking.

The foundational elements of Industry 4.0 also enable traditional activity such as product development and process innovation. The advances of **additive manufacturing (3D printing)** and other technologies are clearly supported by better data sharing and the power of iterations supported by advanced analytics, unprecedented computing power and the concept of digital twins.

A digital twin, also sometimes called a “device shadow,” is a computerized simulation of a physical asset that reflects the status of the actual asset, often fed by sensors. For example, a digital twin can help product development and process innovation by understanding the unique attributes and performance of any given instance of a product. These attributes might include the type and level of use, the specific part revisions used within the product, the suppliers of those parts, the maintenance conducted, etc.

Industry 4.0 can extend beyond the manufacturer into the use of the product in the customer’s hands by leveraging **Internet of Things** (Iot – distinguished from IIoT in this case because of B2C instead of just B2B inference). Charging based on real usage and thus the value of the product becomes possible. For example, GE charging for thrust hours on jet engines or HP charging per print. Aftersales service can be optimized to reduce cost and improve customer satisfaction through informed preventive and proactive maintenance and leveraging this information to improve product design.

COMPETITIVE OPPORTUNITY

The ability and motivation of each manufacturing enterprise to embrace various Industry 4.0 capabilities will be balanced with sustaining current daily operational execution.

There is no single way of embarking on this effort and most manufacturers are in the early stages of laying the foundation for this revolution.

Those manufacturers who make rapid progress will reap early benefits and enjoy the promise of several competitive advantages. Industry 4.0 provides a significant business opportunity to rapidly change how things are designed, made and serviced, specifically:

- In globally competitive marketplaces Industry 4.0 capabilities enable the responsiveness that will determine the vitality of both manufactured product and the corresponding manufacturer.

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- The rapid pace of modern business change and challenges requires unprecedented flexibility fueled by the underlying agile technologies aligned with Industry 4.0.
- Industry 4.0 enables businesses to reach new performance levels through optimized processes and productivity increases.
- New technologies are driving the notion of a "Digital Thread" of information across the value chain. The digital thread can provide, for example, the information need to create digital twins. Over the course of time, the thread could recreate a full product lifecycle which could be analyzed for inefficiencies, leading to radically improved development.
- Many manufacturing markets demonstrate potential for disruptive change, enhanced business models and incremental revenue/ growth potential.

POSSIBLE INDUSTRY 4.0 APPROACHES

Given all the new technology, what would an Industry 4.0 manufacturer look like? Table 1 lists examples of legacy and Industry 4.0 approaches. The Industry 4.0 technologies are characterized by QAD's set of solutions and services.

SUMMARY: IGNORE AT YOUR OWN RISK

Whatever you like to call it, Industry 4.0 is already here. Manufacturers who ignore this, might suddenly find themselves in a disadvantaged position in transformed markets. They might find they are up against stronger new or transformed competition.

The old metrics by which they measured themselves might be significantly trailing what their competitors are using for self-measurement. They might walk up and find they have lost their position in the supply chain, and worse, value chain.

There is no right path toward Industry 4.0, it varies for every manufacturing.

Your Strategic Assessment: For more information on how QAD can help your company better align ERP with your business strategy, contact QAD at +1-805-566-6100 or email info@qad.com.

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TABLE 1: LEGACY VERSUS INDUSTRY 4.0 APPROACHES

	LEGACY APPROACHES	INDUSTRY 4.0 APPROACHES
Pervasive Connectivity	Functionally distinct approaches to solutions Even best of breed systems developed in isolation Heavy customization of individual systems System integration complicated through limited technology and security concerns Integration and information exchange slow with poor change management Paper/manual supply chain systems Poor enterprise informational model limits deeper analytics	Formalized ERP/MES integration via well-defined configurable interfaces and extensions (QAD Automation Solutions, "AS") Interoperability via standards-based solutions (Dell Boomi, QAD Cloud EDI) Loosely coupled architecture supports atomic level upgrades and enhancements (QAD Enterprise Platform) APIs exposing over 1800 business services (micro services) (Channel Islands) Modularized, non-invasive secure computing approaches (QAD Cloud) Collaborative supply chain environment
Smart Sensors	Factory floor islands of automation with limited connectivity and flexibility Time-streamed single data-point values without context Wide-spread manual data collection and corresponding error-prone data entry Multi-level (PLC/HM /SCADA / MES) data aggregation and management hierarchies Minimal data structures or directly actionable data delivery	Purpose-built access direct to spectrum of devices (AS scale integration) Device support for complex data structures (AS) Cognitive context in support of immediate action (AS Data Collection) Directed intelligent action to remote devices (AS Label Printing) Flexible to operational changes through configuration (AS) Guided operator data entry options with validity checks and flow control (QAD QMS and Channel Islands)

TABLE 1: LEGACY VERSUS INDUSTRY 4.0 APPROACHES CONTINUED

	LEGACY APPROACHES	INDUSTRY 4.0 APPROACHES
Advanced Analytics	Large data sets but limited information Isolated functional data sets with limited interoperability Trend reporting without intelligent evaluation Analytics limited to descriptive predefined views Flat data constructs barriers to correlation Poor enterprise informational model limits deeper analytics	Transaction-centric audit trail (QAD QMS) Enterprise view of data enables deeper understanding (QAD Business Intelligence, Channel Islands Embedded Analytics) Transaction duration trends and basis for process improvement (QAD BPM) Lumpy data model integrates text, values, images (QAD QMS and AS) Shared data store and synchronization (QAD Enterprise Platform) (Channel Islands and QAD Supplier Portal)
Advanced Computing	Slow localized computing infrastructure IT outpaced by security and technology requirements Incremental capability embraced on multi-year version cycles with prohibitive efforts around upgrades Restrictive localization and personalization limited to high level access	Flexible deployment architecture (QAD Cloud, QAD Enterprise Platform) Elastic Compute (QAD Cloud) Predictable IT costs and availability (QAD Cloud) 3rd party verified integrated security (QAD Cloud) Configurable fine grained user access personalization and extensibility empowered via agile technologies (QAD Enterprise Platform, Channel Islands)

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