

The Connected Industrial Enterprise

Why Unlocking Data to Enable a Connected Enterprise Is Vital to the Future of Manufacturing



LISTEN.
THINK.
SOLVE.®



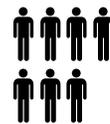
More than 70 million people, most of them in emerging markets, are joining the middle class every year. According to the Organisation for Economic Co-operation and Development (OECD), the global middle class will surge from 1.8 billion in 2009 to 3.2 billion in 2020. This ballooning middle class will translate to greater consumer spending, placing an increased demand on manufacturing, resources and infrastructure.

From your standpoint as a manufacturer, meeting this demand requires you to be more productive, more sustainable and more flexible. Meeting the demands of growing consumer classes in countries like India and China, for example, must be balanced against the need to meet lower price points in those countries. You must ensure compliance in each new country. And you need to consider if it makes sense to source operations closer to these new consumer groups to remove complexity from your supply chain and reduce import costs.

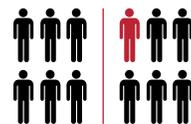
Improving the connectivity across your enterprise's operations will be one key enabler for all of this. A connected enterprise delivers two significant benefits:

1. The ability to **integrate information** across IT and control systems. This enables you to better coordinate your operations and communications, as well as give you greater agility – from the plant floor to the enterprise and facilitating a demand-driven supply chain.
2. The ability to **collect and coordinate data**, and ubiquitously share it in the form of valuable information for different contexts. This ensures better data-driven decision making at all levels, greater consistency of results and improved recordkeeping for regulatory purposes.

Global population has already
exceeded 7 billion



Annually, more than 70 million will
cross into the middle class



Middle class
adding \$8 U.S. trillion
to consumer spending



A Daunting Challenge

Establishing a connected industrial enterprise is far more complex than simply connecting disparate systems. Rather, it involves seamlessly and securely connecting all control and information levels of an organization. It also means having access to real-time and historical operational data, wherever it's being produced, as well as all of the business and transactional data that will impact different plants and their full range of operations. Having the technology and the know-how to distill this data into information that provides true innovative value is the next frontier.

Basic integration of information and infrastructure within manufacturing is approaching a critical mass, but a September 2013 *IndustryWeek* survey of 265 U.S. manufacturing executives, managers and other employees revealed that the vast majority of manufacturers still have a

Manufacturers ranked disparate systems and data sources second behind lack of collaboration as their top business and operational challenges.

long way to go to realize a connected enterprise. Only 14 percent of respondents said their plant-floor data is fully integrated into their enterprise systems, while only 1 in 10 respondents said that at least 80 percent of their plant-floor machinery (not including computers) is Internet-enabled.

LNS Research recently asked manufacturers what their top business and operational challenges are and found that disparate systems and data sources ranked second behind lack of collaboration across different departments for the top most challenges in manufacturing today.¹

Achieving a True Connected Enterprise

As you move operations further into the information age, three components are vital to achieving a true connected enterprise:

1. **Network Infrastructure** – The Industrial Ethernet, using standard Internet and Ethernet protocols, ties your manufacturing data together with the rest of the enterprise. It also provides a future-proof communication backbone for pervasive growth in Internet-enabled devices.
2. **Working Information Capital** – Data mined from across your operations and distributed to employees across your systems as context-based information enables them to do their jobs better.
3. **Security** – Rather than a one-time event, security is an ongoing threat-management practice, policy and culture that addresses gaps, reaches every level and extends out to vendors.

To address these three critical components to help manufacturers securely bridge information and operations technologies across the enterprise, Rockwell Automation is partnering with global leaders, including Cisco, Microsoft, Panduit and others. A connected enterprise enables the plant for the future – one that supports collaboration among a more mobile workforce and secure access for things like virtual environments and remote monitoring.

¹ LNS Research, 2013 Manufacturing Operations Management Survey, 200+ Respondents

Network Infrastructure

More than 50 percent of today's Internet connections are to devices, according to Gartner Research, and that number is only growing. This is all part of the "Internet of Things" — the seemingly infinite number of devices and their interconnectedness via Internet Protocol (IP).

Many devices already being used on the plant floor today are IP-enabled, but an even greater opportunity awaits in the open-standard, IP-enabled devices that can be leveraged from non-industrial settings. These technologies, such as digital tablets, video cameras and RFID readers, provide endless new opportunities for greater productivity, innovation and collaboration, among other benefits.

To take advantage of these devices, your operations must allow these machines and devices to communicate with each other via a standard unmodified IP-centric network infrastructure. The Ethernet Industrial Protocol (EtherNet/IP™) was created to support this interoperability on the plant floor and ensure seamless enterprise-wide connectivity within a single infrastructure.

Proprietary network technologies can restrict network architecture with gateways and specialized devices. They also incur integration and support costs for legacy systems that may not be adequately supported in the future. EtherNet/IP, on the other hand, enables information to flow freely to its intended destination in even the most complex manufacturing operations, allowing greater collaboration across people, machines and devices. EtherNet/IP also can support an unlimited number of nodes for greater flexibility in operations and communications, which will be critical as the number of connected devices on the plant floor continues its upward trajectory.



Southern California-headquartered King's Hawaiian, maker of the iconic sweet bread rolls and other bread products, expanded its operations in recent years with a new 125,000-square-foot facility in Oakwood, Ga. The entire bread-making process required a total of 11 specialized machines, manufactured by different OEMs.

King's Hawaiian needed a common configuration for the OEMs so that everything would connect easily and communicate well and its personnel would be able to monitor processes across the enterprise and make intelligent decisions to increase production efficiency. In addition, clear specifications for its OEMs and an overall integrated design architecture would help the company avoid having to learn several types of PLCs and human-machine interfaces (HMIs), and stock several varieties of the same spare part for repairs.

The integrator on the project, Bachelor Controls Inc. (BCI), a Rockwell Automation Solution Partner, gathered the controller and HMI requirements from each OEM and

wrote an overall specification standardized on the Rockwell Automation Integrated Architecture™ system. BCI then worked with Rockwell Automation to validate the system's design.

All the OEMs were directed to use the Allen-Bradley® ControlLogix® programmable automation controller (PAC) featuring an integrated platform for scalable motion and machine control in a single programming environment. This integration provides King's Hawaiian with fewer spare parts to maintain, while the control platform's openness helps ensure easy integration with third-party components. The specifications also required a standardized approach to the visualization and information software used on each machine.

“The common network architecture enabled us to get this plant up and operational in a matter of weeks instead of months,” said Mike Williams, director of engineering, King’s Hawaiian.

The entire plant communicates via EtherNet/IP. The single network architecture helped the company get the plant online faster and lowered the Total Cost to Design, Development and DeliverSM the machines. EtherNet/IP also allows King's Hawaiian engineers to remotely access, diagnose and service their machines from two redundant VMware servers located in a central control room.

“By standardizing on the Integrated Architecture system, our people are now able to go from one process to another within the plant, and use the same software and same knowledge to address any number of issues,” said Mike Williams, director of engineering for King's Hawaiian. “The architecture also allows us to collect vast amounts of data — about everything from oven temperatures and bake times to scale weights and maintenance operations — that previously we couldn't manage manually.”

“The common network architecture enabled us to get this plant up and operational in a matter of weeks instead of months,” said Williams. “This plant gives King's Hawaiian the capacity we need for the foreseeable future.”

Working Information Capital

The era of big data is here. According to McKinsey & Company, manufacturing generates more data than any other sector, storing an estimated two exabytes (or two quintillion bytes) of data, just in 2010 alone. Controllers, sensors and other devices generate data — from machinery performance and energy use to processing variables and material use — at every point in the production process. With all this data right underneath your fingertips, it's important that you understand how you can leverage it.

Capturing data is fundamental but data without context is not an asset. Converting data into working information capital and putting it into context for workers requires expert guidance. Rockwell Automation understands the operational technology of a plant floor essential to bridging the gap between automation engineers and their IT colleagues to help securely identify, collect, interpret and share the right data with the right people in the right context to drive improvements that have exponential value across organizations.

Creating working information capital across your enterprise can help you optimize life-cycle processes, better respond to changing customer needs and reduce inventory. It also can help you better manage your work flows for more demand-driven production lines and supply chains. Applying working information capital is how manufacturers jump from simple linked operations to smart connected enterprises.

Disruptive technologies can both capture data and share information to improve collaboration and operating efficiencies. The following disruptive technologies are the most relevant to manufacturers:

- **Cloud Computing** – A recent survey of manufacturers by LNS Research showed a doubling of planned adoption for cloud applications in manufacturing.² Moving software applications to an on-premise or off-site data center can free up your IT footprint to reduce maintenance and energy costs. From an operational standpoint, the cloud enables you to innovate ways to leverage your information — including remote asset management and monitoring/alerting, performance or energy monitoring, customer and supply chain collaboration, and more.
- **Mobility** – More than 60 percent of businesses allow employees to bring devices to work, according to the Manufacturing Enterprise Communications Research Services. Mobility is not only inevitable — it's already here. In fact, five terabytes of data were viewed on mobile devices in the last year. And while accessing manufacturing data on any tablet or smartphone is a key benefit of mobility, the ability of information and plant workers to be “mobile” and access applications on the go is just as beneficial.
- **Virtualization** – Untethering hardware from its operating system is increasingly being used in manufacturing. This reduces dependency on physical servers and other hardware — as well as their energy costs — at your plant sites. Virtualization also increases machine reliability, offers lower-cost and high-availability back-up solutions, and allows multiple instances of an operating system to run on a single piece of hardware.

2 exabytes
Manufacturing generates more data than any other sector

5 terabytes
Amount of manufacturing data viewed on mobile devices in the last year

63% of businesses permit employees to bring devices to work

² LNS Research, 2013 Manufacturing Operations Management Survey, 200+ Respondents

Security



Perhaps the biggest concern manufacturers have when it comes to a connected enterprise is security. Whether it's your network, your assets or your intellectual property, operations need to be secure from potential threats — whether those threats are accidental or intentional.

With network convergence and the connection of previously disparate systems, security risks naturally increase. Fortunately, when done correctly, the benefits of a connected enterprise extend to security, meaning you can manage enterprise and automation security together, all the way to the end device.

Because of this, security programs should be done collaboratively and holistically across all operations, rather than as some kind of tacked-on solution. Security must be woven into plant-floor operations — including the network infrastructure, new and legacy control systems, machinery, devices and your enterprise — as well as across every person, policy and procedure.

User-access security is just one example of protecting who can do what. This defense-in-depth approach will give you multiple layers of protection and deterrents against a diverse range of potential security breaches.

Lastly, when assessing the security program of your organization, make sure to include vendors or suppliers. When it comes to security, you'll want to evaluate them as you would your own organization — your network security can be dependent on their network security. This is especially important in highly regulated industries such as life sciences, food and beverage, and automotive, where capabilities like track and trace are top of mind.

The benefits from a connected enterprise will extend across your operations:

- **Supply Chain Integration** – Greater insight into deliveries and improved communications with suppliers regarding scheduling changes, order increases and other issues can help you optimize your inventory management and ultimately help drive faster time to market.
- **Collaborative, Demand-Driven** – Connecting your manufacturing operations with your informational systems means you're also connecting your employees across functions, empowering them to better collaborate and work toward one common goal of meeting customer demand.
- **Optimized for Rapid Value Creation** – Data can be mined from every step of your operations to help drive efficiencies, improve quality, better manage inventories and speed up time to market. The continual collection of data and distribution of working information capital also allows you to set the bar higher for ongoing improvements and establish best practices in plants around the world.
- **Compliant and Sustainable** – Synchronizing your business processes and work flow can produce the real-time and historical data you need to ensure compliance and improve sustainability metrics, and lower overall corporate risk.

To discuss how a connected enterprise can benefit your operations, call a Rockwell Automation sales office or visit: <http://www.rockwellautomation.com/connectedenterprise>.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846