Business Perspective

Profiting from the IIoT

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Contents

Profiting from the IIoT

1. Introduction

Industrial organizations are investing in digital infrastructure with high expectations of quick, better payback. They are relying on the Industrial Internet of Things (IIoT) to deliver trillions of dollars in business value by driving innovation in operational efficiency, business management, safety, and security. Fulfilling this promise requires new solutions for integrating intelligent industrial devices, regulating them effectively, and optimizing operations around them. Providing part of the solution is a new breed of controller: a key automation component for the IIoT. Like traditional programmable logic controllers (PLCs), it supplies edge technology to control connected assets, but augments it with Ethernet connectivity, built-in cybersecurity, and processing power needed to handle Big Data analysis and protect against new vulnerabilities. Companies are already applying IIoT-ready controllers to improve time to market, manufacturing productivity, energy efficiency, data visibility, and security.

2. Don't leave money on the plant floor

There is much talk these days about the IIoT. Senior managers across industry are wondering whether this is mostly just talk or if it can translate into real profitability for their plants. The latter view is rapidly winning out. Accenture, for example, estimates that IIoT-enabled business efficiencies and related business models could potentially contribute some $14 trillion to the global economy.[1]

A September 2016 survey conducted by PwC (formerly PricewaterhouseCoopers) consulted more than 2,000 participants from nine major industrial sectors and 26 countries. Gary Mintchell, founder and CEO of ***The Manufacturing Connection,*** felt it offered key insights: "Are we getting beyond the speculation and hype of ideas such as Industry 4.0 and digital manufacturing? This latest survey and study by PwC (www.pwc.com/industry40) reveals that executives anticipate benefits from [digital infrastructure] investments within two years ... Maybe the strategies and technologies behind Industry 4.0 and Internet of Things and digital manufacturing actually will help us cross the next manufacturing divide."[2]

> ***"Executives anticipate benefits from [digital infrastructure] investments within two years ..."***
>
> **— Gary Mintchell, Founder/CEO, *The Manufacturing Connection***

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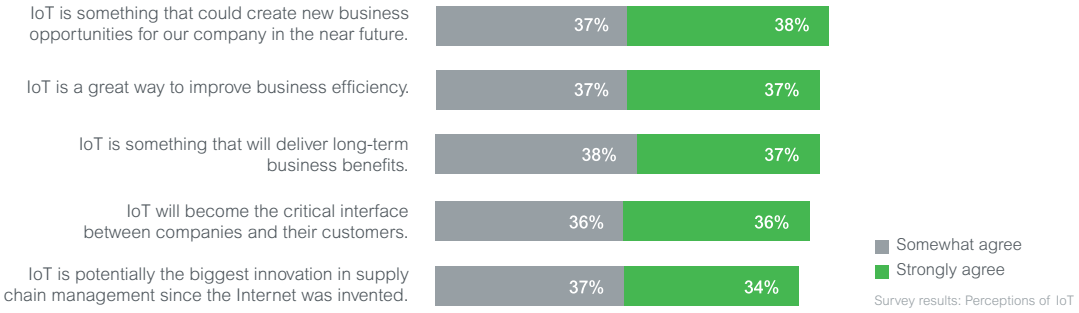
3. Planning for profitability

Other survey highlights Mintchell summarized include the following:

- "Industrial manufacturing companies plan to invest 5 percent of annual revenue in digital operations solutions over the next five years.
- "Many companies are already producing machines to deliver on the vision of the connected factory, using the power of the internet to link machines, sensors, computers, and humans in order to enable new levels of information monitoring, collection, processing, and analysis. This is adding to the products and services that companies can offer their customers, helping them work in collaborative ways in the design of future machines and their digital environment to boost performance.
- "A number of technologies, including robotics, cobotics, 3D printing, and nanotechnology, have direct relevance for many industrial manufacturing applications while other technologies, such as augmented reality, can enable manufacturers [to] give customers real-time information and training at the point of use."

Revealing similar expectations for profitable industrial innovation, an April 2016 Schneider Electric global survey[3] of more than 2,500 business decision-makers outlined a growing consensus that the IIoT makes increasingly good business sense:



Can today's new automation technologies achieve their operational profitability goals? That depends largely on how well they can transform their existing infrastructure to help increase production value and reduce operating expenses — especially raw material, energy, and security costs — within an accelerating global economy.

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4. Maintaining control

Historically, when industrial operations need to balance multiple variables, they have turned to automation — including ***Edge control*** (at the "edges" where local real-time decisions meet higher control functions), plus advanced ***analytical*** software.

The ***continuous process*** industries — including Oil & Gas, Chemical Production, and Power Generation — have used ***distributed control systems*** (DCSs) to bring increasingly larger proportions of enterprise processes into their scope of control. ***Discrete manufacturing*** industries have used ***PLCs*** successfully for years to control product assets and eliminate inefficiencies in their operations. And ***hybrid*** industries, combining both continuous and discrete operations in Food & Beverage, Water Treatment, and other municipal operations, and so on, focus on automating batch and continuous operations.

5. Accelerating change

The challenge for all is to implement automation in a way that improves the bottom line. Most of the control strategies employed today evolved in response to a business climate that remained more or less static. However, manufacturing now operates in an environment that increasingly expects greater outputs at lower costs — with no letup in sight. The IIoT is both a product of and a contributor to the change, and continually forces itself into consideration.

Production operations were already growing in complexity. When you factor in the potentially large number of intelligent devices that will become interconnected, and all the Big Data that might emerge in the wake, the kinds of control schemes needed for implementation will be of mammoth proportions. DCS technology can probably handle this scope of control, but the programming and process engineering required to support it will become increasingly more difficult to cost-justify.

An automation model that may well prove more workable under these conditions shifts from solving control logic and process control across entire processes to solving them at the ***asset*** level. The process for each unit is then solved, optimized, and linked to other assets by communications. This is conducted in the context of a hierarchical structured analysis, similar to that advanced by Tom DeMarco in his industry classic, ***Structured Analysis and System Specification***.[4]

6. The need for new controllers

An asset-centric approach is very similar to what has been done with PLCs since Modicon™ introduced them to the market 50 years ago. Although these devices have flourished on the industrial landscape ever since, will traditional PLCs — and their more recent successors, ***programmable automation controllers*** (PACs) — continue as control workhorses at the asset level? While retaining as much as possible of existing investments in control infrastructures, controllers need some additional features to handle the changes that the IIoT is already launching and that will continue to advance over the next 15 to 20 years.

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Among the most important requirements are Ethernet connectivity to be able to extract data for use in enterprise productivity applications; enhanced processing power to handle increasing complexity; cybersecurity protection to make it safe to obtain the benefits of open computing; and an advanced, object-oriented engineering environment to reduce engineering costs and time.

7. Controlling the industrial internet of assets

The newest controllers mark the arrival of a new category: The ***IIoT-ready PAC***.

From a control standpoint, the IIoT might well be considered the industrial internet of assets. And these advanced new PACs are perfectly positioned to supply all the information that managers need about those assets. Their future-proof benefits can include preprogrammed application libraries and open engineering environments; device-level cybersecurity; fully embedded Ethernet; and fault-tolerant design.

> *"You retain much of the control infrastructure investment you've made in the last 25 years. But you also get the IIoT-ready technology you'll need for the* next *25 years."*
>
> **— Jan Dekker, Founder, RASTER Industrial Automation BV**

Jan Dekker, founder of industrial automation systems integrator RASTER, says, "For senior executives, the message is that the right PACs will let you retain much of the control infrastructure investment you've made in the last 25 years. But you also get the IIoT-ready technology you'll need for the ***next*** 25 years."

The hybrid industries in particular are realizing that the newest PACs can start delivering real IIoT advantages today. And that failing to upgrade means you're leaving hidden revenues lying on the factory floor.

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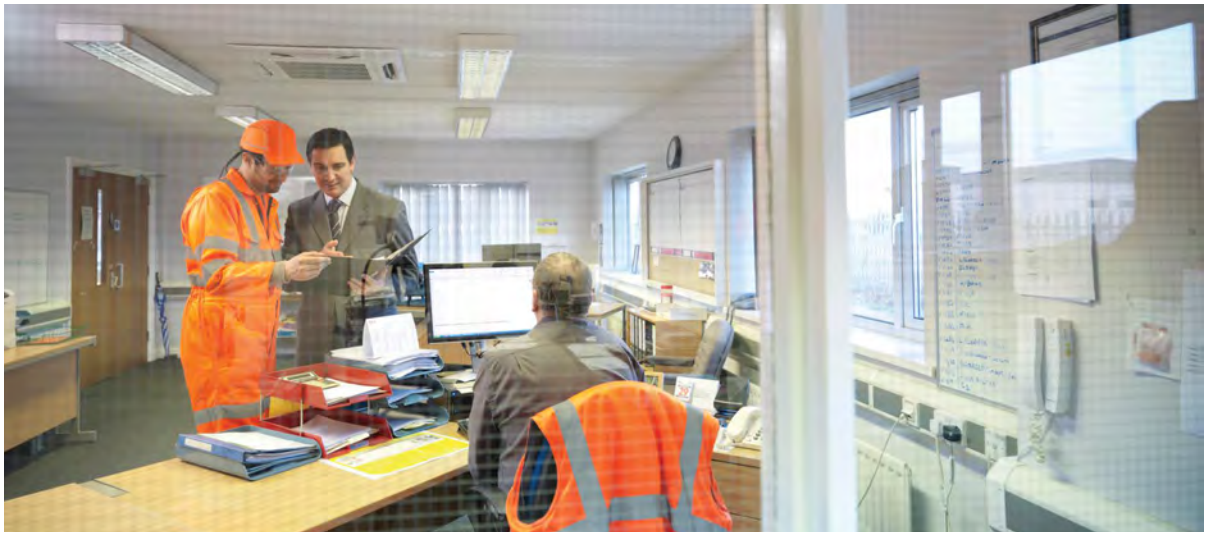

8. Driving real business value

Especially when used with object-oriented integration environments, advanced PACs measurably drive significant increases in business value. Even in the short term, executives who oversee brownfield or greenfield modernization automation projects could see return on investment (ROI) on these PAC expenditures in months, not years.

And in the long term, automation projects centered on the right PACs should demonstrate even greater return on assets. They're already improving operational profitability and safety for plants worldwide, in ways that directly impact the organization's bottom line.

Here are just some of the ways that PACs equipped for IIoT capability are already having an impact:

- **Increased productivity.** Using such advanced PACs, a feed mill in Vietnam, for example, has achieved 3X faster feeds production. And by standardizing on one control products family, it has cut cabling costs significantly. Overall, the mill has increased production by 3 percent, and reduced costs by 30 percent.
- **Increased operational visibility.** Lacking precise data on asset location, process status, etc., can cost up to 3 percent of yearly revenue — and create a significant margin shortfall for the typical discrete/hybrid manufacturing plant, with substantial bottom-line impact. A PAC automation project with open and transparent native networks can bring much-needed operational visibility.
- **Cost-efficient energy management.** Calculations show it's possible to reduce annual energy consumption at an average large facility from $6 million to about $4.8 million, by making energy usage data more efficient and transparent.

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- **Speeding time to market.** Modern controllers implemented within object-oriented programming environments can save millions in project launches, shorten time to market by at least 25 percent, and benefit from the extra production that can result from getting production online earlier.
- **Cybersecurity protection.** Manufacturers now have a 32 percent chance of experiencing a hostile cyber event or cyberattack in any given year.[5] Using advanced PACs in key roles within comprehensive plantwide cybersecurity strategies can drastically reduce the likelihood of cyberattacks — critical in a world where the total costs of a data breach average more than $3.7 million.[6]

Thus the increases in business value that can be derived from this new generation of controllers make upgrading easy to justify, even in times of continuing downward pressure on capital costs.

The Modicon M580 Ethernet programmable automation controller (ePAC) possesses industry-leading processing speed and memory, plus stronger embedded cybersecurity. Its core Ethernet capabilities allow seamless, faster, enterprisewide access to operating data. For the hybrid industry, it's considered the highest-performing PAC in the marketplace — designed as the right controller for the IIoT and beyond.

9. Summary

Different individuals evaluate the advantages of transformative IIoT differently. Plant managers chiefly concern themselves with operational productivity and staff safety; control engineers consider ease of design and technical excellence; maintenance managers may most value the ability to identify issues quickly and troubleshoot them easily. Senior executives, while cognizant of all these concerns, must maintain a laser-like focus on issues such as profitability, shareholder value, and growth.

Gaining IIoT advantages using the most advanced PAC technologies has already been proven to provide substantial gains in all these categories. These controllers can help manufacturers achieve blazingly fast ROI — and, even more importantly, inspire exciting new business models that will help them realize substantial impacts on overall profitability for years to come.

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About the author

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Dr. Peter G. Martin is a recognized leader and innovator in automation and control. He has been a practitioner in the field for over 37 years; has authored three books, coauthored two, and been a contributing author for three more; and has published dozens of articles and papers in these disciplines. He holds or has pending multiple patents in the areas of real-time business measurement and control. He was recognized by *Fortune* as a Hero of U.S. Manufacturing, by *InTech* as one of the Fifty Most Influential Innovators in Control, and by *Control* as a member of the Automation Hall of Fame; he has also received ISA's Life Achievement Award. Martin has a B.A. and an M.S. in mathematics, an M.A. in administration and management, and a Ph.D. in industrial engineering, as well as a master's and a doctorate in biblical studies.

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