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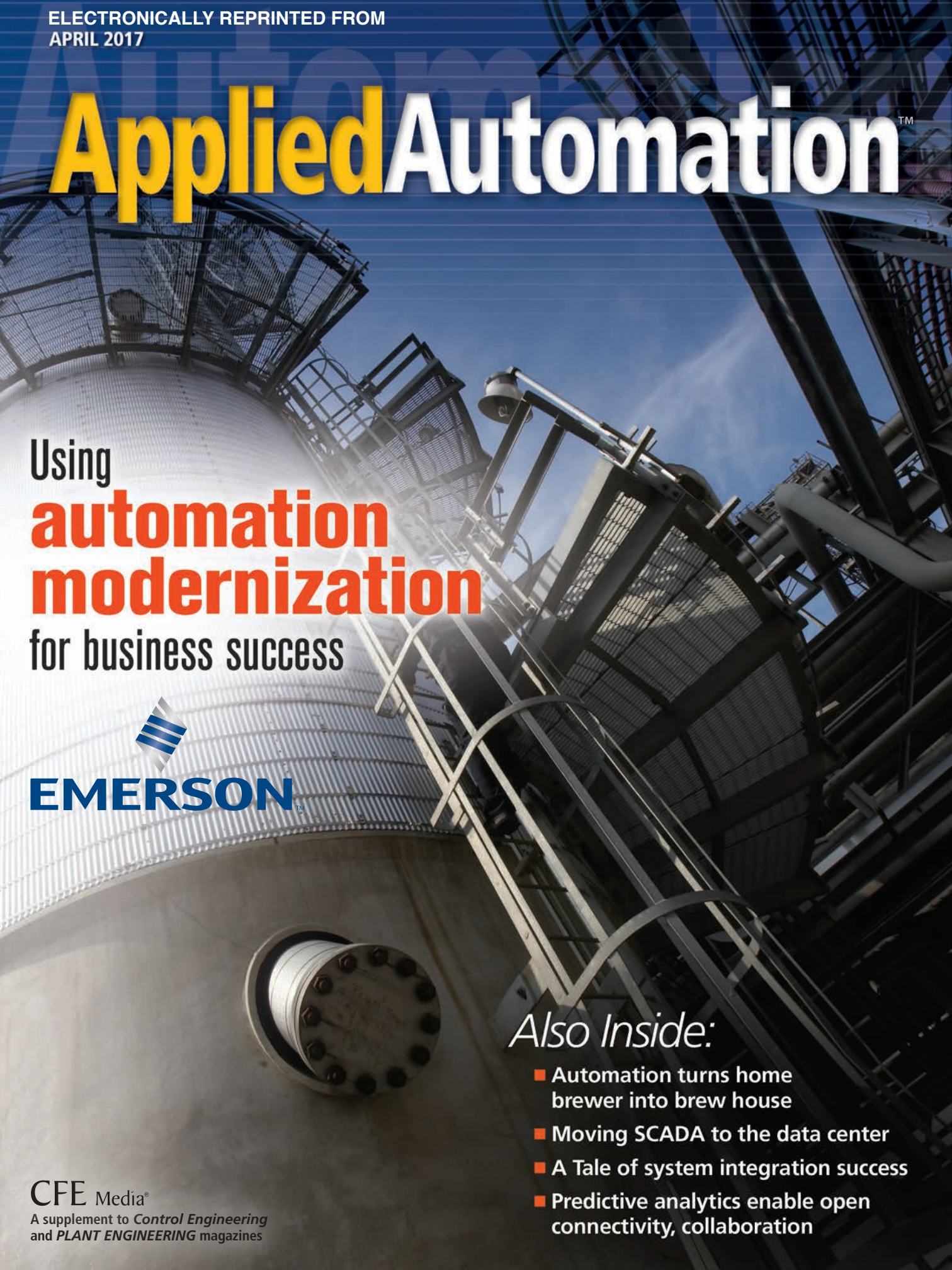

Using automation modernization for business success

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Using automation modernization for business success

When a facility must improve productivity, process availability, and enterprise profits, modernization of the control system can provide the answer. Lasting differences can be made by taking advantage of today's advances and creating more profitable operations.

By Laurie Ben and Aaron Crews
Emerson

The reasons for a control system modernization project do not appear overnight. They gather and grow over time while productivity, process availability, and enterprise profits degrade—often without management and operations realizing why. The following key indicators usually mean a control system modernization or migration project is on the horizon.

Expense. The automation system is expensive to keep healthy.

- Replacement parts are difficult to obtain, expensive, or nonexistent.
- Expertise on legacy technology is expensive and difficult to find.
- Onsite, skilled, expert support dwindles as individuals retire.

Decreasing value. The automation system has few tools and technologies to help meet current business needs and market pressures.

- The current automation system offers limited flexibility to address operational needs and demands.
- The current technology limits the ability to easily address industry regulations and competitive pressures.
- Expansion of the process or system is limited by the site's automation technology.
- The ability to address personnel capabilities and effectiveness is limited by the site system, and limits the span of control because it's required to do more with less.

Many facilities are being short changed by old technology, but others have used best practices to transition successfully.

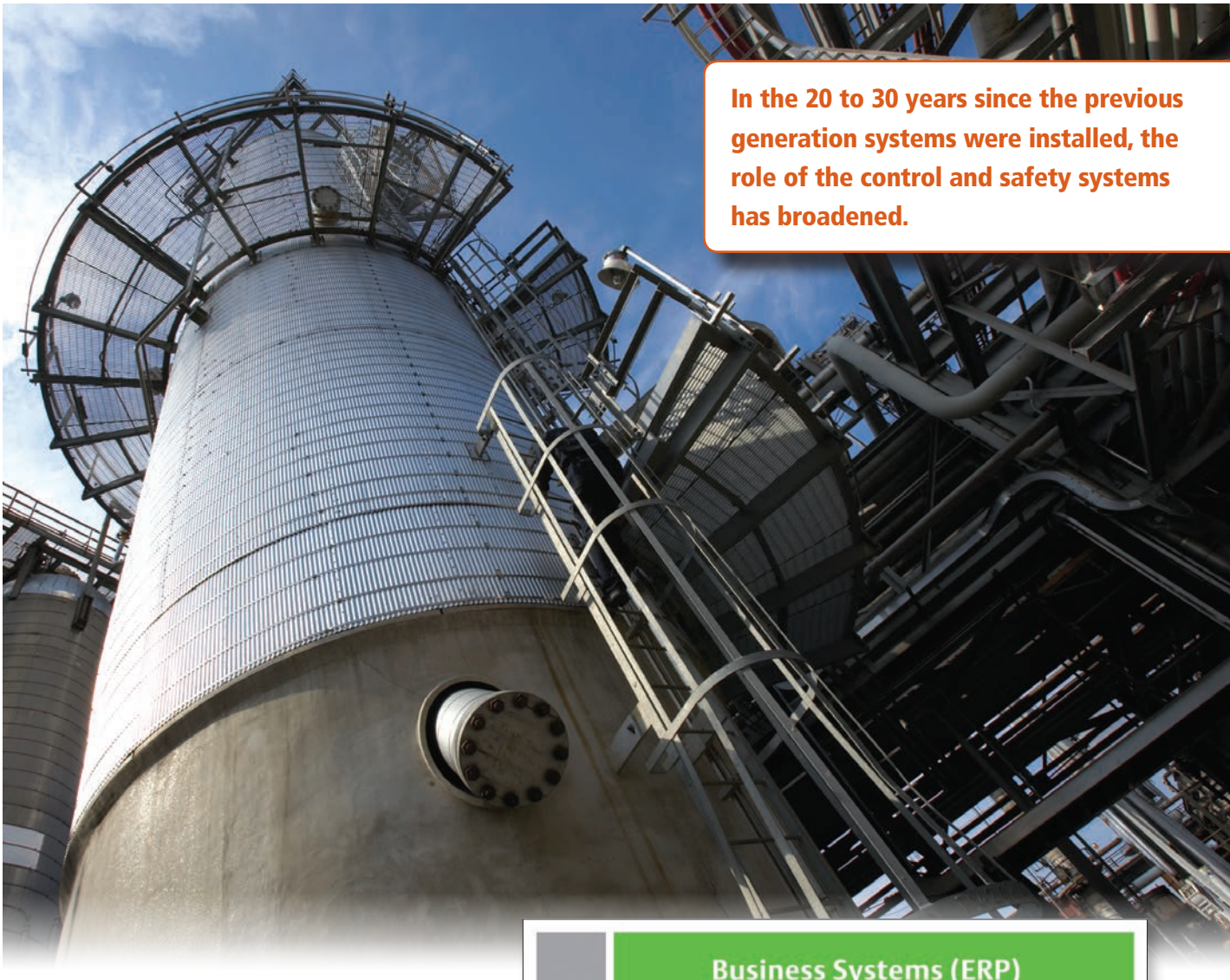
Recognizing the need

Simply knowing it is time to replace the current control system does not mean others in the organization will be supportive. Plant management may see this capital project only as an infrastructure upgrade. Operations management may be concerned about disruption to workflow and the risks of a new control system (see Figure 1). How can management be convinced to come onboard willingly? And how does one ensure they are pleased at the completion of the project?

First, realize you are not alone. In "Managing the Transition to a Modern DCS," ARC Advisory Group estimates approximately $65 billion of obsolete automation technology exists in the installed base. Many facilities are being short changed by old technology, but others have used best practices to transition successfully.

Second, recognize that if aligned with business drivers and seen as an opportunity for increased profits, a modernization project will be approved more easily by management. Although possible to scope a modernization project as a replacement-in-kind infrastructure upgrade, it is not the primary goal. Rather than swapping out one system for a similar system, consider the facility's needs and draw out potential long-term returns.

To be most successful, follow best practices and start planning now. Members of the site's modernization team can be recognized as heroes when their well-planned project delivers powerful returns to profits and personnel. The team can be the lever for great improvements if it does the prep work and shows—then delivers—the value.



In the 20 to 30 years since the previous generation systems were installed, the role of the control and safety systems has broadened.

Figure 1: Whether it's a refinery, chemical plant, or pharmaceutical facility, knowing when it is time to replace the control system can make all the difference. All graphics courtesy: Emerson

Leveraging enterprise improvement

In the 20 to 30 years since the previous generation systems were installed, the role of the control and safety systems has broadened. Today's automation systems are more efficient and can play a larger role, not only in making product, but also in creating more profitable overall operations. Business-critical functions beyond process control and process safety applications use data from the distributed control system (DCS) and safety instrumented system (SIS). This information drives reliability programs, energy efficiency programs, environmental reporting, site safety, and many other applications (see Figure 2).

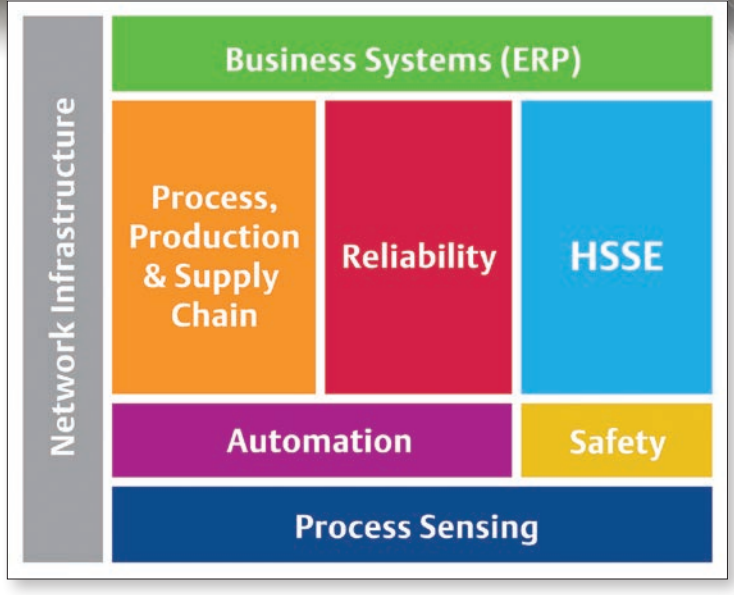


Figure 2: Automation is at the base of a manufacturing organization and can lay the foundation for strong returns on investment.

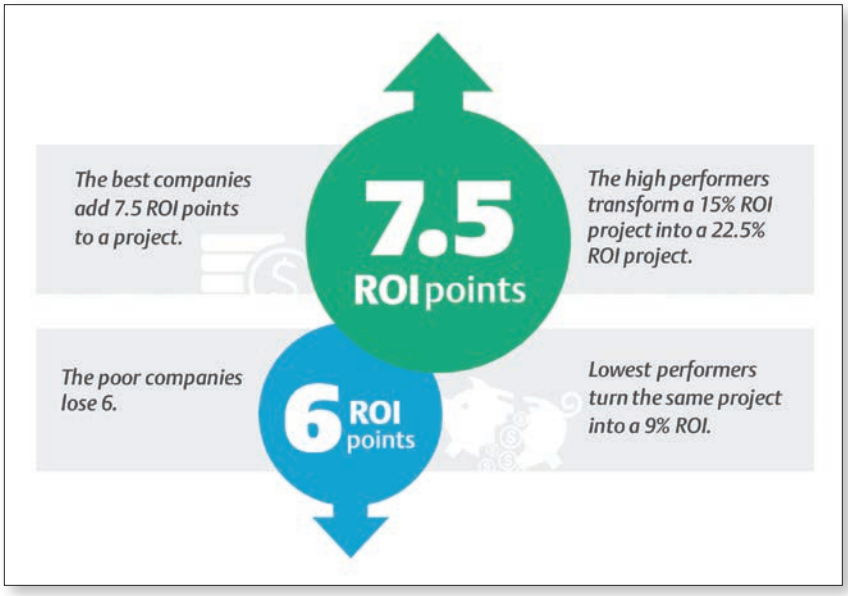


Figure 3: Best practices for manufacturing capital projects can bring strong returns through early planning and matching project objectives to business requirements.

Figure 4: Good front-end planning leads to as much as 20% cost savings and 39% schedule reduction for total project design and construction. Courtesy: Emerson; data compiled from Construction Industry Institute

Modernization project teams can drive success by engineering a solution that distributes accurate and timely information to personnel enterprisewide, brings high-quality products to market, and delivers strong profits. Because the DCS is the link between manufacturing and upper-level business decisions, an updated automation system can enable the business to meet long-term objectives. And because the enterprise depends on automation availability and reliability, a DCS modernization can be a lever for enterprise improvement.

For example, a large chemical plant recently analyzed excessive energy consumption and low repeatability of on-spec product quality. It also realized that its outdated control system required replacement, and it opted for a modernization project.

Rather than simply replacing the control system in-kind, the company added model predictive control (MPC) and asset management software to its modernized DCS. It also improved field controls with updated mass flow meters, valves, digital valve controllers, and measurement instrumentation.

Management was pleased with the team's modernization results, which included an 18% reduction in annual energy consumption, a 10% increase in production throughput, and an overall improved product quality.

Given the opportunities waiting for and the challenges faced by the organization, how can teams achieve success in a DCS modernization? Experience in delivering successful projects is distilled into three behaviors:

1. Begin with the end in mind
2. Actively manage project risk
3. Use a forward-engineering philosophy.

Begin with the end in mind

At the beginning of the project, define a clear vision for the DCS modernization. Include the entire project scope: platform, instruments, infrastructure, training, and engineering. And remember to define metrics to demonstrate success in meeting goals (see Figure 3).

Consider the business objectives most important to the organization as a whole, as well as ones for the site or enterprise that can be positively affected by automation. Target significant goals that align with the current focus of the business, which usually fall along the lines of safety, availability, and process optimization. Improvements in each of these areas naturally improve operational certainty and act as levers to deliver measurable, predicable results.

- **Safety:** DCS modernization is an ideal project to improve the overall health, safety, security, and environmental compliance of the plant.
- **Availability:** Because the DCS directly impacts the availability of the plant, the new modernization project and automation methods can reduce planned (changeover or scheduled downtime) and unplanned (equipment failures or material shortages) slowdowns.
- **Optimization:** Automation can be used to optimize the plant through reduced variability and overall improved performance. That kind of goal would leave lasting impressions on the management team and on company profits. Results could be obtained whether the modernization goals include improvements in through-

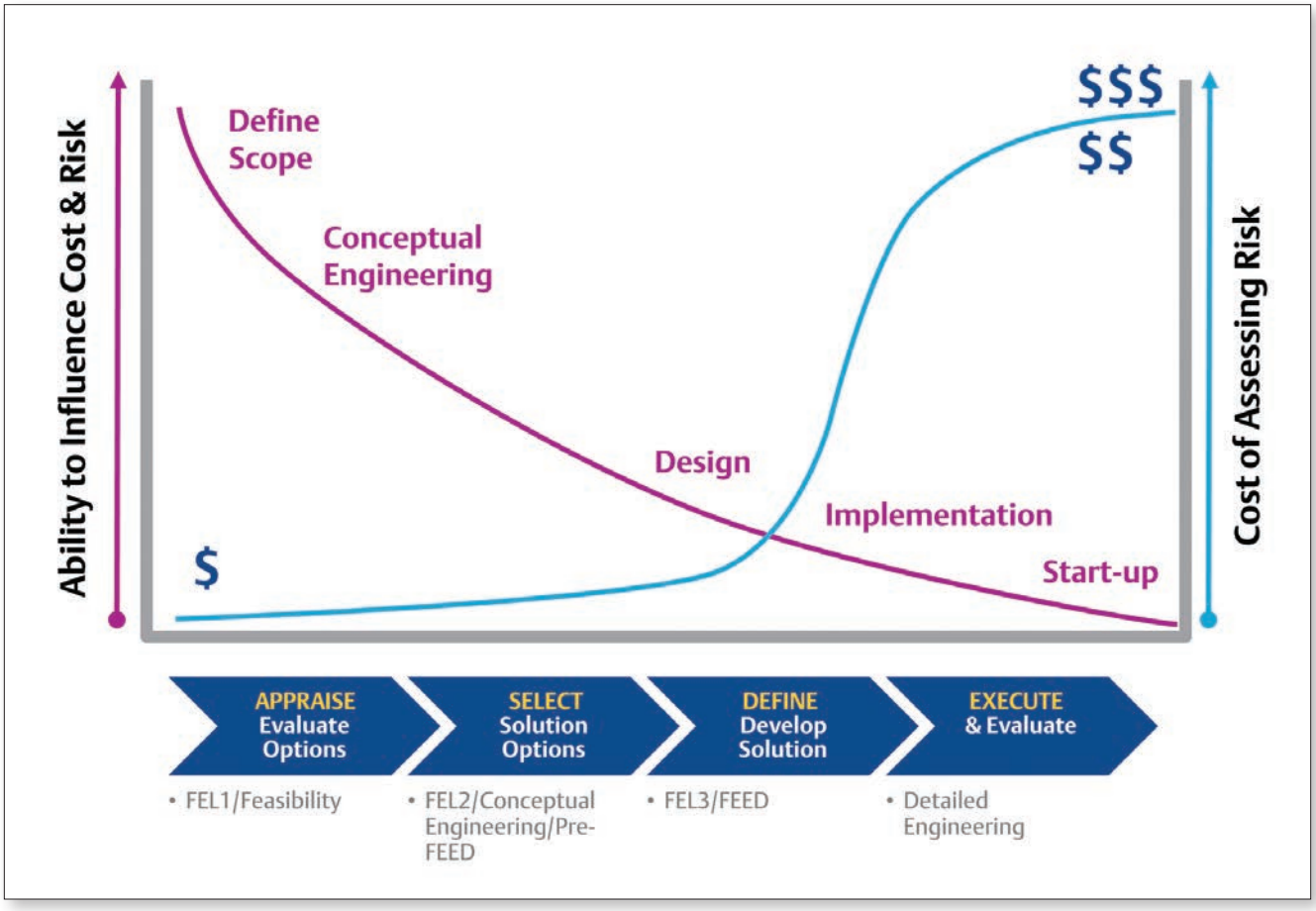


Figure 5: Addressing risk early in a project is more effective and less expensive. Waiting until implementation to address risks is much more expensive.

put or quality, or reductions in key measures such as energy usage or operator performance.

Recently Emerson worked with a global pharmaceutical company that was experiencing a high batch failure rate, low capacity usage, high materials consumption, and first-pass quality below targets.

In planning with the end in mind, the company matched its actions to its key business driver: addressing patients' needs. Availability and optimization would help the company achieve the highest quality product in the shortest time. It knew failures could be reduced by improved availability, and it saw that optimizing the process would improve its first-pass quality. So, it followed a three-phase approach including digital instrumentation and control retrofit, MPC application, batch automation, and recipe management.

The results, which included 800 consecutive batches without failure, a 33% increase in throughput, a 7% increase in first-pass quality and an 80% reduction in product release documentation, showed management that its decisions and actions were successful.

Actively manage project risk

Actively managing project risk is a function of early planning, technical ingenuity, and key stakeholder involvement. By tackling the project in phases (from defining scope to starting up), teams can compartmentalize risks involved. Teams have the most leverage in reducing risk in the beginning of a modernization project (see Figures 4 and 5).

In any automation project, there typically are three major constraints that a running plant must deal with: space, time, and budget.

- **Space:** Can new cabinets fit into existing rack rooms? How do we reconcile 30-year-old wiring practices efficiently and cost effectively without pulling new home-run cables?

- **Time**: Can we easily reconcile outdated field and cabinet wiring documentation against "as-found" instruments and marshalling systems? What is our cutover strategy? If shutdowns are required, what is

the shortest length of time to complete the cutover to the new DCS and return to production?

- **Budget**: How much scope is possible within budget?

Early planning can assist with technology, project scoping, and execution decisions that affect all three of these areas, allowing the full benefits of new technology to be evaluated and maximize the potential for ROI.

For example, technology, such as electronic marshalling, can assist with space, time, and budget constraints. Some technologies allow field wiring of any signal type to be terminated anywhere and routed to any controller, which allows the project team to choose the most cost-effective location to cut over the system. The result is reduced total installed commissioned cost (TICC). In Emerson's case studies, it has seen electronic marshalling reduce the TICC of a project by 15% to 20% (see Figure 6).

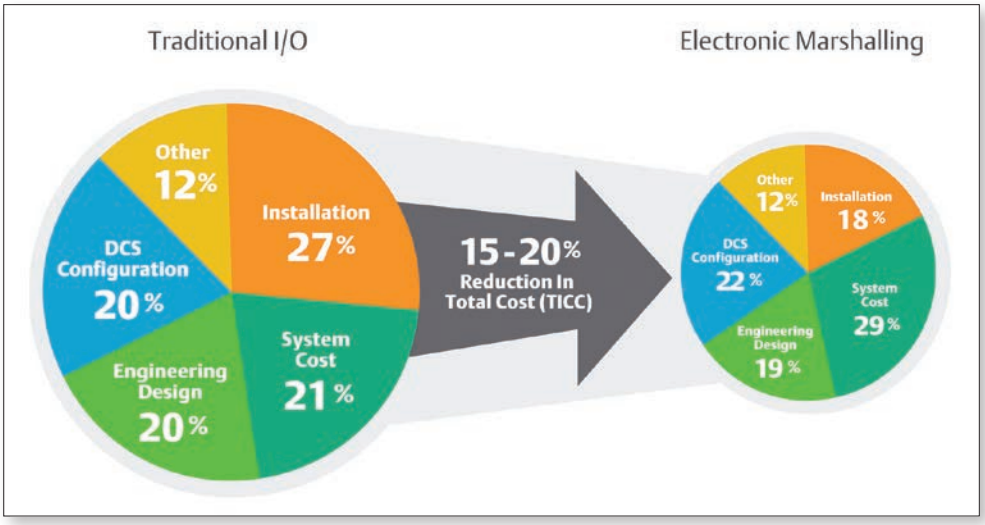


Figure 6: Early planning for use of electronic marshalling helps deliver more value at a lower cost than traditional input/output (I/O).

Risks can be managed by ensuring that operators are well trained and ready to use the system.

Risks can be managed by ensuring that operators are well trained and ready to use the system. Operators who are ready to start on day one significantly increase the performance of the plant. In fact, the operations group can be a valuable partner in early planning. It provides key insights on important efforts, constraints to work around, and behaviors required for operation and maintenance of a modern DCS.

Use a forward-engineering philosophy

Forward engineering leverages existing control strategies and parameter information from the legacy system while implementing complex loops using the capabilities of the modern system. In modernizing a DCS, project engineers provide the hooks to unlock the business value available in the new system.

The modernization team can allow for concepts, such as conditional alarming, as well as the use of an asset hierarchy for navigation/control/alarm management, and human-centered design in graphics.

Applying forward engineering to its project, an Emerson customer recently successfully implemented a new DCS. The business results proved that operational improvements can arise from modernizing alarm management, operator graphics, and site documentation.

Specifically, this customer based its alarm philosophy on the ISA 18.2-2009: Management of Alarm Systems for the Process Industries standard and set alarm priorities based on impact to safety, community, environment, and financial loss. Its attention to detail in the modernization process eliminated many nuisance alarms and reduced its total DCS alarms significantly, thus improving operations availability and safety.

Obvious value leads to stronger management support

When a facility must improve productivity, process availability, and enterprise profits, modernization of the control system can provide the answer. Lasting differences can be made by taking advantage of today's advances and creating more profitable operations.

Step up to deliver the value of a modernization project. The results can be well worth the effort in time, money, and individual value. Success lies in using best practice project methods. Begin with the end in mind, actively manage project risk, and use a forward-engineering philosophy. As seen at other enterprises, your migration project will bring strong returns.

***Laurie Ben** is the director of global modernization business development at Emerson.*

***Aaron Crews** is the director of global modernization solutions at Emerson.*