Optimizing Global Engineering Efficiency With a Holistic Project Approach

When executing global projects, engineering companies have to meet challenging requirements from their customers to implement projects under compressed schedules and tight budgets while delivering solutions that meet high quality and safety standards. To fulfill these requirements, engineering companies must standardize their delivery methodology to achieve a faster implementation and start-up, and optimize costs and productivity, without compromising quality and safety. To help deliver consistent project outcomes that minimize the impacts of these challenges, engineering companies often rely on gathering, rationalizing and sharing global domain expertise in the form of reusable engineering content, such as industry software libraries. These libraries of functionality are critical for standardizing complex designs in a repeatable way. In fact, many companies attempt to minimize project risk by depending exclusively on industry software libraries. However, successful project execution requires a more holistic approach. Rockwell Automation relies upon a unified, flexible work environment comprised of a standard delivery toolset embedded with deep domain expertise, rigorous, process-driven project methodology, and vigilant governance processes. This unique methodology helps minimize risk by driving efficiency and consistency in projects, regardless of location or access to qualified talent.

Introduction

Globalization and disruptive technological advancements, such as virtualization, cloud and big data, are continually altering the industrial landscape. To succeed, innovative companies must re-envision where and how they do business so the right resources are applied regardless of their location. In the past decade, concepts like virtual teaming and multioffice execution began to play major roles in the operating strategies of engineering, procurement and construction (EPC) and global engineering firms. Offshoring is no longer isolated to manufacturing, data processing and call-center positions, as a growing number of firms move engineering, design and development work overseas as well.

Cost reduction is a primary driver for these moves and a top concern for both facility owners and EPC contractors, given today's complex global environment. To further minimize costs, many owners also are tightening requirements for EPC contractors – they want firms to assume more risk while meeting tighter project schedules.

On top of cost pressures, the increasing difficulty of finding qualified engineering personnel looms large for owners and EPC firms. After all, even the most advanced virtual teams and multioffice capabilities cannot succeed without the right people in place.

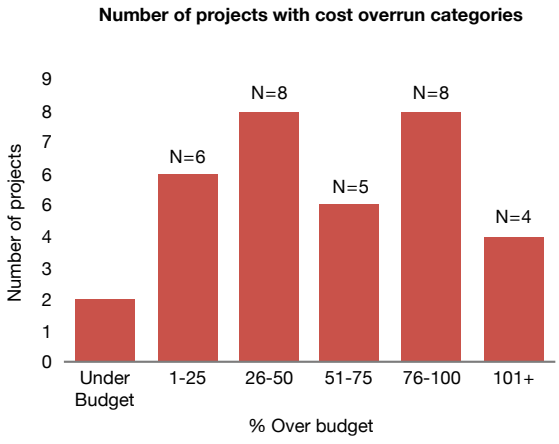
The skills shortage has received significant visibility in developed regions, such as North America and western Europe. This deficit is driven by trends, such as downsizing, EPCs refocusing on core competencies other than automation, and the increasing wave of retiring baby boomers. The growing skills scarcity even extends to newly advanced economies, such as China. While that nation graduates large numbers of engineering students annually, too few highly trained and qualified personnel are available to fill the requirements of the process industries.

Companies are implementing multiple strategies to simultaneously reach cost-reduction goals for capital projects, while finding experienced and qualified personnel to execute projects, and operate and maintain their plants, including :

- Teaming with automation suppliers to provide this knowledge and fill the skills gap.
- Sourcing engineering services globally.
- Tapping global virtual engineering teams for around-the-clock engineering support.
- Locating services close to the project location or equipment and vendor locations.

The global nature of many of these strategies means that execution will necessitate collaboration from locations with varying levels of IT infrastructure, different engineering tools and best practices, diverse engineering backgrounds, and varied industry domain expertise – not to mention cultural and communication differences. The reality is that most companies do not have the proper tools and infrastructure in place to effectively address these complexities.

Overcoming these project challenges overwhelms some manufacturers. The 2012 PricewaterhouseCoopers Global Project Management Survey found that "poor estimates/ missed deadlines" was the greatest factor contributing to poor project performance. Additionally, research found many of these projects exceed budgets by at least 50 percent.



Source: "Insights and Trends: Current Portfolio, Program, and Project Management Practices." 2012. PricewaterhouseCoopers LLP

Investing in front-end engineering and design can help companies overcome project cost overruns, as well as help develop a detailed project scope, budget and timeline to reduce risk and uncertainty during a project's design and commissioning phases. Trusted third-party service providers, such as Rockwell Automation – a leading provider of automation turnkey solutions for process industries – can help companies navigate complexities related to global project execution through the entire project life cycle. Rockwell Automation relies upon a unified, flexible work environment comprised of a standard delivery toolset embedded with deep domain expertise, rigorous project methodology, and detailed governance processes. Regardless of a company's access to qualified talent or location, this approach helps minimize risk by driving efficiency and consistency into projects.

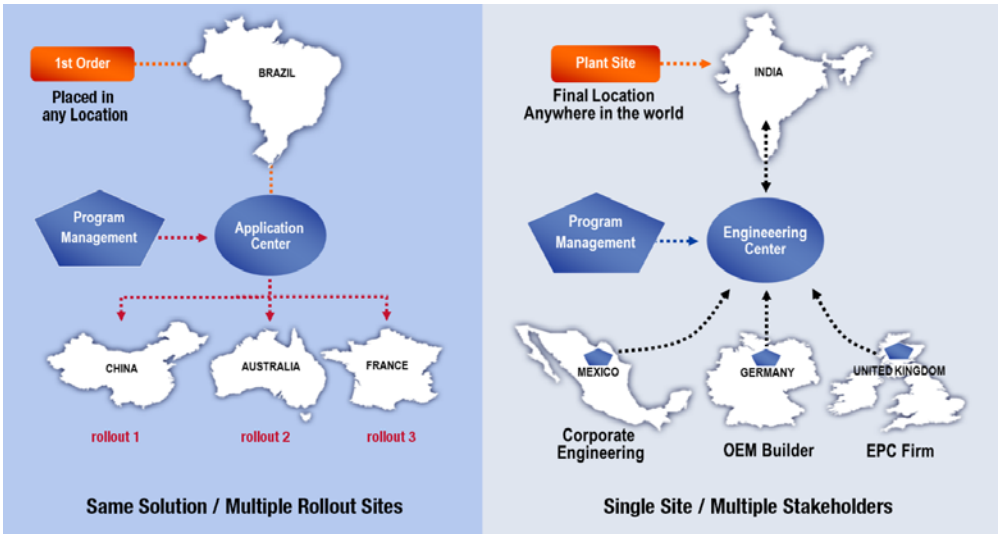
Developing a Holistic Approach: The Building Blocks of Success

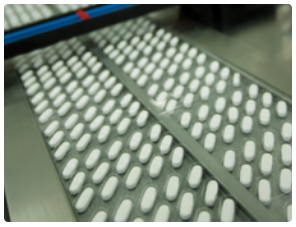
Industry Libraries: A Core Element of Effective Execution

Companies embarking on global projects face a myriad challenges related to schedules, start-up time, cost, productivity, quality and safety. Overcoming these challenges can be difficult. In their quest to deliver consistent project outcomes, many engineering companies rely on industry libraries containing engineering content. These standard software modules of industry functionality are critical for standardizing complex designs in a repeatable way. Industry libraries are just one element to successful project execution – a holistic approach also includes project methodology and governance processes.

In most large organizations that deliver automation solutions, engineers are designing and implementing solutions:

- For multiple customers around the world.
- For the same customer at multiple locations.
- For turnkey projects that require the coordination and management of the scope from multiple vendors.





In the past, it was standard practice for two developers to design the same software module in different ways. The process can be simplified if the developers instead agree upon the fundamental function and desired output. Then the code is consolidated into a standard, repeatable solution that can be stored and re-used in the future. The library grows as multiple repeatable functions are defined and stored.

Creating libraries of content drives efficiency in engineering because developers can reproduce code automatically rather than starting from scratch or re-testing the same code multiple times. In addition, global engineering teams can tap into industry-specific domain expertise, regardless of who is executing the project. This efficiency and access to expertise drives repeatability, scalability and a higher quality standard.

The process and quality standards involved in creating a robust library are critical to success. When a re-usable piece of content is identified, multiple domain experts must help define fundamental requirements and contribute their domain expertise to understanding broader requirements as well. Additionally, all library content should undergo a rigorous life-cycle-management process. Content is continually refined and updated with each project, which means end users not only benefit from schedule improvement inherent in using a library approach, but they also receive better quality and a reduced risk profile.

Project Methodology: Creating a Common Work Environment

A well-defined project methodology is critical to consistently and efficiently develop a robust library, and apply it to customer specific applications. For Rockwell Automation, a common, flexible work environment serves as the foundation and a single point for engineering data.

The traditional approach to engineering involves gathering inputs from a customer, writing a functional specification, designing, writing application code, testing and commissioning. Multiple sets of data are maintained throughout various stages of the project. When new or updated data comes in, it is generally only applied to the current deliverable, which has a ripple effect, and can erode quality and affect timelines.

By using a common work environment, there is a single source of data used to create and update customer requirements, which improves consistency of output, improves data quality and minimizes risk. Standardized engineering content from industry libraries is available within the tool. A collaborative environment allows engineers – including contracted engineering resources – to access this content and work concurrently. Plus, a common database for the project is updated automatically.

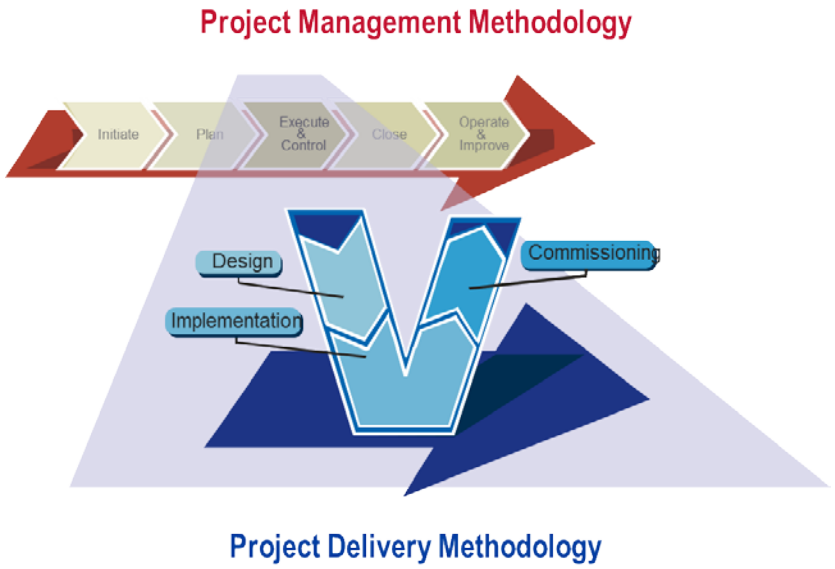
Global teams can design and develop the control strategy and work independently to increase delivery speed. For example, an engineer at a pharmaceutical plant in Mexico designs and debugs a bioreactor unit's operation controls, as an engineer in India works on the site's process control platform. All the while, a hardware engineer is working on hardware design, testing and procurement to support the deployment of the application. The company's lead engineer then takes the results from all sites, and can integrate them remotely with minimal effort. This approach creates a consistent output based on industry best practices and domain expertise, and drives standardization across teams, locations and knowledge levels.

Engineering outcomes can vary from project to project, and industry libraries can include a variety of content – such as process control code, visualization information, documentation and testing – all scalable across geographies. Using a common work environment also

helps automate the capture of project requirements more accurately, regardless of the outcomes. Data, such as configurations and alarm limits, is gathered electronically and automatically input into the work environment accessed by engineers throughout the project. End users save time and money because the engineering content being applied to their project already has been tested on multiple projects and refined along the way.

Governance Process: Consistently Managing Quality

The Rockwell Automation approach to global project execution is supported by delivery standards and processes governed by a quality management system (QMS) that helps minimize risk by driving quality through the project process. This system regulates how project deliverables are defined and specifies the procedure for executing them.



Every engineer is required to follow the QMS and processes in place when executing work to help embed consistency across all projects. This includes following defined work instructions for key process steps, using standardized templates for engineering deliverables, and using defined work packages when transferring work to regional centers for customization. To further reduce risk, project teams participate in quality gate reviews and internal audits of active projects.

The QMS helps reduce any inconsistencies in project delivery, helps ensure a standard deliverable that fully meets the end user's expectation, and reduces project risk via quality gate reviews and risk assessments. To use a consumer example, if a customer is buying a car, both parties will naturally expect a vehicle that will move them from Point A to Point B. However, there are many questions related to how this will happen. Will they have control over shifting? Will there be air conditioning? Will the windows roll down automatically? These questions need to be answered ahead of time – and the functionality of each individual "extra" needs to be clearly defined.

The QMS helps eliminate any gray area. For example, if the buyer wants air conditioning, there is no need for the buyer and the dealer to discuss how air conditioning is defined. They both know what to expect, and there is a standard deliverable.

A Holistic Approach in Action

Industry challenges related to regulatory compliance and speed were particularly important in a recent project executed by Rockwell Automation for G-CON, a builder of biotherapeutics-manufacturing facilities. The holistic approach to project execution delivered by Rockwell Automation helped overcome these challenges.

Traditionally, drug manufacturers have built inflexible and expensive production facilities that take three to seven years to complete and even longer to validate for production. With the advent of single-use technologies and process improvements, a paradigm shift is occurring, making such large-scale facilities a thing of the past. Instead, modular, scalable, flexible manufacturing solutions are the industry's goal. G-CON created the POD platform to respond to this need.

PODs provide flexible manufacturing environments for both new and traditional therapeutics.

G-CON and Rockwell Automation collaborated to develop a severely compressed schedule that called for many steps to occur simultaneously. The POD concept was key to making this tight schedule a reality. While the shell of the facility was under construction, the downstream process PODs were built and commissioned at G-CON's neighboring manufacturing facility.

The Rockwell Automation life sciences toolkit of engineering content made rapid development of "smart" systems within the POD possible. Additionally, Rockwell Automation was able to train G-CON's engineers on how to use the toolkit, allowing them to take advantage of pre-validated code. The common work environment made it possible to codevelop new applications and products remotely from multiple locations. The Rockwell Automation QMS mandates that all documentation aligns with GAMP guidelines for the life sciences industry. The team was able to reduce testing time and validation costs, further impacting the ability to deliver the project on budget and within a tight timeline.

Conclusion

Many manufacturers today are confronting the reality that they lack the proper tools, personnel and infrastructure necessary to successfully navigate the complexities inherent in global project execution. By tapping the expertise of engineering companies like Rockwell Automation, manufacturers and their engineering firms have access to the application expertise, engineering toolsets and documentation that can be applied to multiple facilities. This unique holistic methodology helps minimize risk by driving efficiency and consistency into projects – regardless of geographic boundaries.

[1] *Global Virtual Engineering Team Utilization in the Engineering, Procurement, and Construction (EPC) Industry,* Technical Report N. 49, 2005. PENN STATE CIC Research Program.

[2] Supplier Provided Automation Services Worldwide Outlook. Market Analysis and Forecast through 2015, ARC.

[3] *Global Virtual Engineering Team Utilization in the Engineering, Procurement, and Construction (EPC) Industry,* Technical Report N. 49, 2005. PENN STATE CIC Research Program.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, 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

Publication SSB-WP002A-EN-E – November 2014