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Ingenuity for Life

Digital Lifecycle Excellence

Digital lifecycle excellence provides the foundation for improving productivity in operations

Today's energy and utility (E&U) leaders must meet their business and production targets to remain competitive in their industries. E&U businesses also require a high level of financing to fund their capital projects and operational expenditures and have to compete with other sectors to attract scarce investor resources. They must do this while enduring record market volatility and selling their products for commodity prices at the lower end of the normal range. Furthermore, there are demands to transform energy so they can improve their environmental sustainability while decarbonizing operations. The future leaders in the industry will accelerate their ability to optimize and innovate by learning how to apply their physical and digital assets to deliver top performance across all categories.



The complex nature of digital plants and assets

Capital-intensive industries, such as the E&U industry, are made up of complex plants and assets supported by enormous amounts of technical information. Each facility has a lifecycle that starts with its conceptual planning and carries through to its eventual decommissioning. The gigabytes (GB) of data and documents representing the new project are received from organizations across the supply chain during the “data-handover” phase before operations commence. They contain the combined input from all stakeholders who contributed to the asset from the beginning to commissioning and start-up. Depending on the contract requirements, project deliverables will typically include massive amounts of paper documentation and Microsoft Office software files and often a mix of 2D drawings and 3D models with varying degrees of intelligence. With the hectic nature of start-up operations, most of these deliverables are quickly loaded into file-based document management systems or stored on local drives. Minimal time is available to be spent organizing, validating and verifying the information to be of value to the operations and maintenance teams. As such, valuable insights that could support more efficient start-up and ongoing operations become challenging to find when they are most needed.

The reality at most companies is there is little consistency in their asset information. Different plants were designed to different standards using a variety of tools. At the time there was minimal thought given to the idea that project data could

be so valuable to ongoing operations. In 2004, the National Institute of Standards and Technology (NIST) released a landmark report called “Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry.” It concluded that in 2002, the U.S. capital facilities industry typically lost 4.2 percent of the total project value due to inadequate systems interoperability, which was equal to \$15.2 billion in that year. Those losses were never budgeted for, but directly contributed to cost overruns on the majority of those projects.

Plant data management remains an opportunity

Fast forward to 2020. Do we have more robust collaboration tools? Yes. Have they been generally utilized to improve collaboration? Yes and no. Have the interoperability problems been resolved so that owner-operators can fully leverage their project data? No. Many in the industry would suggest the interoperability problem remains largely unresolved. However, given the explosion in the volume and complexity of digital information since the NIST 2004 report, it's now widely accepted the problem's magnitude is much more extensive today. A quick Google search on cost and schedule overruns on major capital projects across all segments of the energy and utility industry confirms this. A recent study from Ernst & Young entitled, “Spotlight on power and utility megaprojects – formulas for success,” reported most power and utility megaprojects exceed their budgets by 35 percent and miss their scheduled start-up date by an average of two years.



Nevertheless, knowledge workers in the E&U industry are resourceful. The projects were executed and completed with the available tools. The lack of interoperability between the embedded silos of project information were likely bridged using thousands – or even hundreds of thousands – of spreadsheets on each project. Unfortunately, this came with a hidden cost.

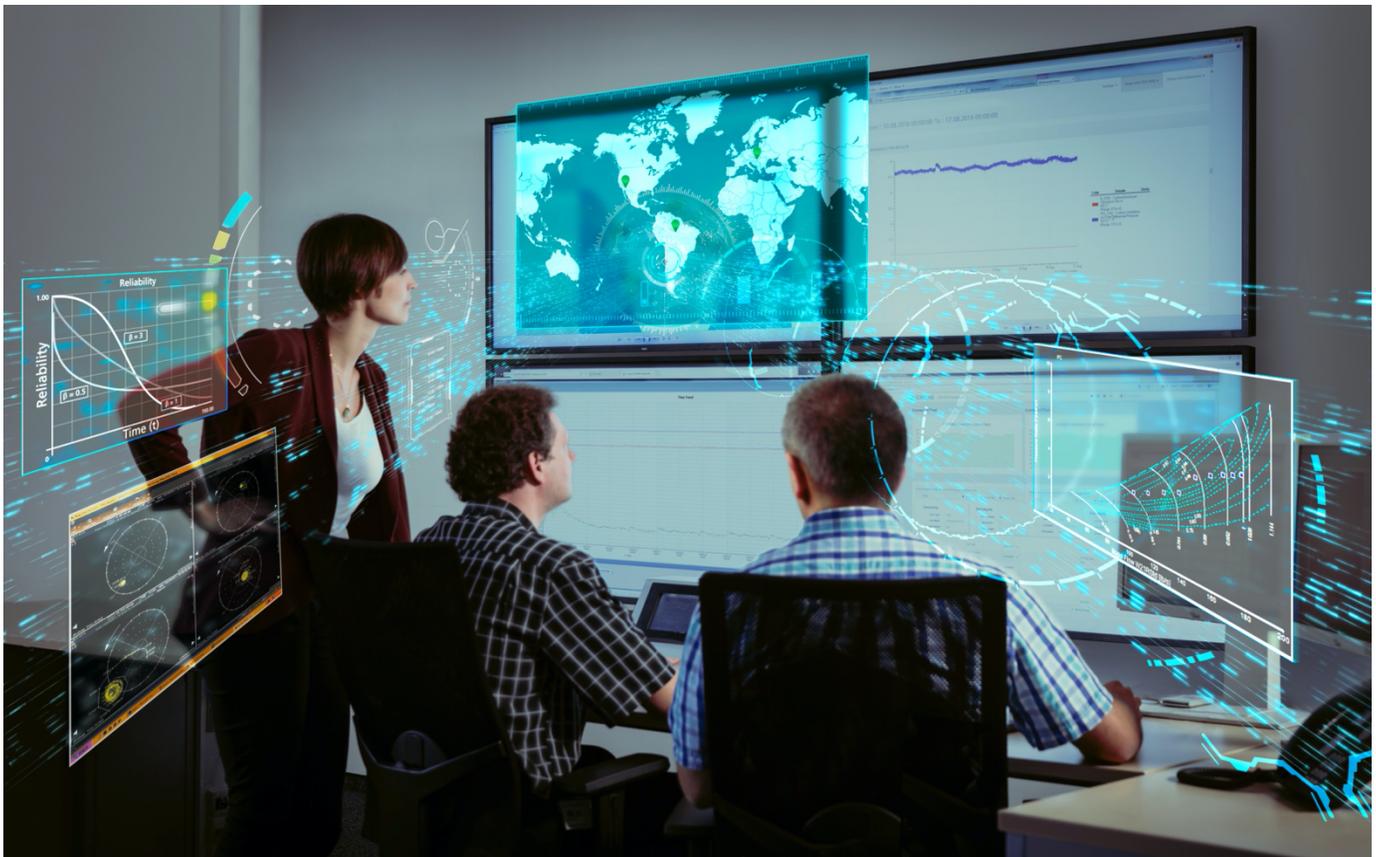
First, spreadsheets are unmanaged and unsecured. They're difficult to keep up to date and can walk out of any door on a thumb drive. Second, the only people that can readily understand them are the people that created them. But all project teams change, and even the best workers retire, taking with them their priceless understanding of how to find the correct information to make the right decisions. Lastly, the legacy spreadsheets accompanied truckloads of paper documents along with gigabytes of PDF files and design data. The net effect was a significant efficiency loss that impacts those working to operate and maintain plant assets to optimize production and meet their targets. According to the NIST study referenced above, "The single largest impact is on information verification and validation, or the time spent ensuring the information actually represents what is set in place," representing billions of dollars in the 2004 study. Furthermore, plant engineers then invested hundreds of millions of dollars, "transferring information into a format that staff members can read and use to perform their activities."

Realize operational excellence using the digital lifecycle

Today, intense global competition, explosive market dynamics and the industry's energy transformation are all creating a level of business strain not seen in decades. Tomorrow's industry leaders must build a higher level of digital enterprise competence and use it as a source of competitive advantage to become the best in their industry. As with any significant project, it requires a solid foundation that soundly supports the improvements to follow.

A solid foundation opens a world of opportunities

An asset's lifecycle begins with a statement of initial requirements and conceptual engineering and ends with its decommissioning. From start to finish, knowledge workers from many disciplines add incremental value with contractual requirements and deliverables, calculations, simulation results, design data, construction plans, commissioning instructions and operational information gathered along the way. The information produced during the lifecycle becomes both large and complex over time. As with any asset, that information has value and must be maintained to stay viable. However, similar to a newly discovered metallic orebody, those who can define and understand the data can extract valuable insights that can be applied elsewhere. Hence, attaining excellence in the management of the digital lifecycle creates opportunities to improve overall business performance.



Enabling a manufacturing mindset for E&U

Although the use of lifecycle management practices in the manufacturing industries has been successfully employed for decades, E&U businesses were not able to fully leverage it. This was mainly due to incompatible or closed data formats that prevented valuable design models from being consolidated and the intelligence trapped within them from being applied elsewhere. The NIST study discussed earlier highlighted that as a significant contributor to data handover costs. However, recent advances in enterprise data management have solved this problem and cleared the way for E&U businesses to adopt a "manufacturing mindset" for getting more value from their data. Producers can now consolidate equipment design and operation data from original equipment manufacturer (OEM) suppliers, plant design information from engineering contractors and operations and maintenance systems information to a much greater degree. With this, E&U businesses can now integrate with their supply chain much more effectively to improve results while reducing costs and errors.

The value of connecting systems of systems

A digital lifecycle approach allows technical and business information to be authored in their native systems, often by third parties. The output is then connected to an information backbone that acts as a central nervous system for the plant lifecycle information. Combining these "systems of systems" creates a new level of awareness up and down the lifecycle. Changes in the data for a given area become immediately known to the rest of the system. This creates opportunities to improve decision-making and traceability and dramatically improves change management, which is needed to keep the comprehensive digital twin up to date and accurate. Knowledge workers executing a capital project or operating and maintaining complex systems and plants are better prepared to respond to issues before they become costly situations. By linking contract requirements with deliverables, contract fulfillment increases with less effort, and valuable information trails are created to verify compliance or resolve disputes when needed.

Additionally, consolidating digital lifecycle information and connecting it to an integrated backbone reduces the valuable time wasted when scarce professional resources spend time looking for information. By positioning innovators to be more efficient and have more time, great ideas can be put into operation faster, which improves competitiveness.

Lastly, new technologies such as rapid application development can be effectively applied to your assets' more viable digital twin. This provides knowledge workers from any department with a unique ability to quickly create tailored and adaptable software solutions that offer critical insights into what they need to know with near-surgical precision. Combining new capabilities with better information means avoiding the typical time, expense and delays incurred

in finding a commercial solution while getting better results faster.

Digital lifecycle excellence must begin now

Now is the time for organizations to take action and understand how digital lifecycle excellence can improve their business while there's still time.

Establishing an accurate and well-maintained comprehensive digital twin of operations will provide a single, aggregated view of the design and regulatory information connected to the physical asset information. This integrated approach will be critical to evolving the design, construction and maintenance of facilities for peak performance across the lifecycle.

As global competition continues to challenge the E&U industry, accelerating digital investments that will increase an organization's effectiveness will prepare them for tomorrow's market challenges. The next black swan events could be just around the corner. However, using intelligent digital investments that directly improve operational excellence, energy leaders can demonstrate they can compete in the energy production supply chain. At the same time, they present a better business case to attract investors and institutional lenders to ensure they have the capital they need to grow and prosper.

