

How does our industry in Europe keep up with the global economy? The journey to Smart Industries and Digital Transformation

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Patrick Kools
Yokogawa Europe
Solutions B.V.
Netherlands

Abstract - While the concept of applying digital technologies to improve operational excellence isn't new, in 2019 a staggering US\$ 345 billion was earmarked for digital transformation initiatives in process and manufacturing industries. These investments are considered to be the largest of their kind by any industry worldwide, according to the International Data Corporation (IDC). The question thus arises: what's driving these large-scale investments in digital transformation in recent years? The answer lies in both the changing market and consumer preferences.

Fluctuating commodity prices have had a tremendous impact on process industry earnings of late, while pressure to decrease capital expenditures year-on-year is weighing on traditionally asset-heavy industries. Increased competition and consolidation mean that speed rather than size has become the deciding factor for success. Moreover, a new generation of tech-savvy but less experienced workers are replacing veterans, leading to an experience gap. Simultaneously, the expectations of industrial customers' have been rising due to exposure to technology and tailored consumer experiences, driving demand for more customized solutions.

I. DIGITAL TRANSFORMSTION

Digital Transformation (DX) offers certain compelling responses to these challenges in production and manufacturing.

- 1. Agile response to market changes**
A clear view to financial, asset, and production data across the value chain speeds up decision making and time to benefit.
- 2. Remote and autonomous operations**
Empower your facility to run, learn, adapt and thrive in tomorrow's environment.
- 3. Increased customer loyalty**
A 360-degree, seamless customer experience and journey contributes to increased customer conversions and loyalty.
- 4. A culture of innovation**
Digital transformation generates enthusiasm and inspires product and service development. Employees feel empowered through education.
- 5. Increased internal collaboration**
Collaboration improves between business functions to unlock greater business value and efficiency.
- 6. Sustainable economic excellence**
In a survival of the fittest, businesses that adapt and lead in digital transformation enjoy a lasting competitive advantage.

Many advanced digital technologies, such as artificial intelligence (AI), autonomous robots, cloud computing, intelligent sensor technology, and augmented reality (AR) have become cost-efficient, providing firms with a clear view of financial, asset, and production data across the value chain, and empowering them to respond more promptly to market changes. Remote and autonomous operations are bridging the experience gap in process industries, and big data is being used to develop deeper customer insights. Firm-wide adoption of DX also strengthens collaboration and innovation.

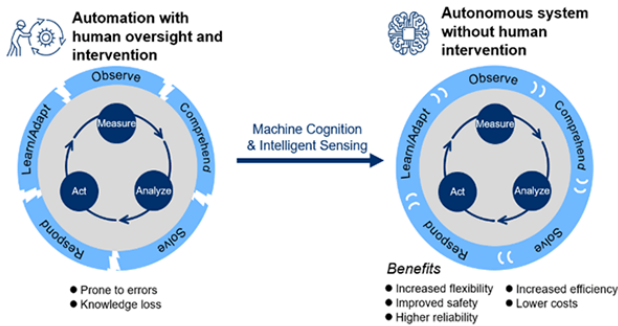
II. DIGITAL TRANSFORMATION AND THE INDUSTRIAL ENTERPRISE

Digital transformation as the novel use of digital technology to accelerate business strategy. It is about the application of digital technologies to empower people, optimize processes and automate systems of an organization to radically reorient its business performance. With DX, technology is evaluated based on its ability to strengthen business strategies, human capital, processes, data, and assets.

DX has applications throughout an enterprise. For instance, in sales and marketing, creating customer journeys with the aid of big data analysis can bolster customer acquisition, while in middle office, AI can enable HR departments to analyze thousands of candidates for best-fit.

Once DX is applied to manufacturing it can often be classified as 'Smart Manufacturing'. integrates the use of technology-assisted processes to create and deliver products and services in a way that is adaptable, data-driven, and integrated with other domains within enterprise value chains.

The key benefit of smart manufacturing is deriving real-time data from the manufacturing process for decision making and problem solving across the organization. This entails deriving and integrating data with the use of devices and solutions such as intelligent sensors, computerized control, and production management. This integration enables an enterprise to collect and utilize real-time data, such as raw material availability and work-in-progress inventory to improve operations.



Smart manufacturing is also uniquely positioned as a driver in the shift from automation to autonomy in process industries. Industrial autonomy transcends industrial automation by adding layers of intelligent sensing and AI to anticipate and adapt to circumstances, both known and unforeseen. In a fully autonomous operation, the industrial system is responsible for all aspects of operation, from start up to shut down (see above graphic).

While unattended remote operations are a first step in the autonomous journey - with a number of companies realizing benefits in productivity, flexibility, and safety - human interventions and decision-making remain important as plant personnel learn to work alongside autonomous systems. The integration of autonomous/human systems is a near-term goal across the industry, but organizations need to approach automation as an evolutionary challenge.

III. DIGITAL TRANSFORMATION AND THE SHIFT TOWARDS SMART FACTORIES

A key pillar of digital transformation lies in a firm's ability to integrate information technology (IT) throughout its operations - in concert with operational technology (OT) - and human resources. Given the breadth of OT in manufacturing, the machines, devices, and control mechanisms of modern factories often operate in relative isolation and communicate using a variety of niche protocols. This creates silos, communication difficulties, and procedural blind spots. A blended and hybrid architecture which can connect on-premise (Industrial Internet of Things) IIoT devices to cloud-based systems creates an ideal digital solution platform, enabling the linking of legacy systems and better management of data quality.

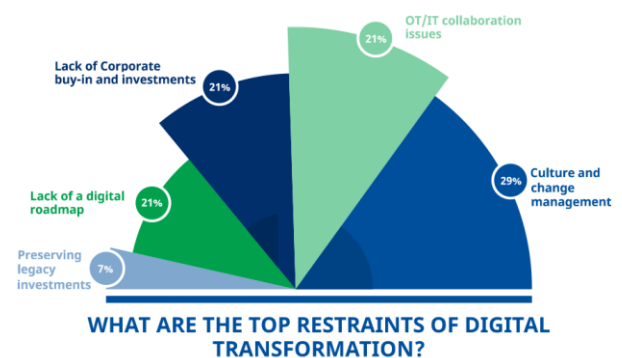
Enhanced IT/OT convergence is also leading to the rise of smart factories using digital twins. Digital twins are a key element for implementing smart manufacturing and industrial autonomy initiatives to realize operation optimization, asset failure prediction, and the reduction of process development lead time. A digital twin typically resides within an on-premise IT system or in the cloud, and it emulates all or part of a manufacturing operation (figure 15). AI and simulation technologies are used either individually or in tandem to analyze a digital twin and create added value by, for example, predicting equipment malfunctions. Based on these predictions and analysis of historical data utilizing AI technology, an AI system can propose multiple recommended countermeasures.

IT/OT convergence is changing the way manufacturers work, and the skills that workers need. More and more, engineers are being tasked with work that has traditionally

been done by software developers and network specialists. Thus, smart manufacturing requires the organic linking of not only processes and technologies, but also the integration of people skills to achieve stable, sustainable, and profitable operations.

IV. CHALLENGES AND THE PATH FORWARD

A survey by Forbes shows that almost 70% of digital transformation efforts fail, and as per research among our end users in the Process Industry, the most common reasons for failure are culture and change management issues, followed by challenges posed by OT/IT collaboration. While each organization is different, there are some industry-wide best practices which have proven to work for many and can be easily incorporated by those undertaking their manufacturing DX journey.



A. Align the digital strategy to corporate strategy

Many organizations approach digital transformation as a one-time strategy-development exercise. This often leads to unclear vision of the digital element across the organization, followed by limited C-level support and IT involvement. In fact, a survey conducted by McKinsey pointed out that only 8 percent of their surveyed companies felt that their current business model could remain economically viable if their industry keeps digitizing at its current course and speed?

To keep up with the demands of industry, a more strategic approach is needed to link DX objectives to an organization's business goals and strategy. This helps incumbent companies to explore new digital business models as they align their investments in creating operational excellence. In other words, DX should be a driver of corporate strategy and senior management must support these with the same rigor as their core business initiatives.

B. Mapping current state capabilities

Whether you are at the start of the journey and would like support in planning your digitalization roadmap, or whether you are looking for an implementation partner who understands how to safely deploy new technologies in a plant environment, every DX journey is unique and supported by enabling technologies and services. Along with maturity and operational assessments, your focus areas and desired outcomes will be used to guide you in determining your ideal approach for creating value. Organizational strategy, operational challenges, risk appetite and automation ambitions should be the drivers to decide a digital target state roadmap.

C. Break organizational silos and collaborate

Kodak invented the digital camera, but its management was resistant to change and shelved the whole project. Why? It threatened the company's legacy film business. DX, by its very nature, requires people to change their ways of working and break out of organizational silos and into collaboration on key projects. While corporate restructuring can eliminate some of the existing organizational silos that exist, it's often a lengthy and complex process. A more practical approach is to empower employees to lead DX efforts. By identifying the most influential people at key points across the organization and inviting them to participate in a digital transformation task force, a company can create buy-in and trust among employees. This, in combination with communication mechanisms like townhalls, blogs and social media, results in wider employee collaboration and, ensure that your DX efforts will face far less resistance.

D. Organize processes around customers

DX requires a mindset and culture that places the market, customer value, and customer experience first. A report published by Deloitte Insight demonstrates how, over the course of a year, customer experience-driven businesses grew revenue 1.4 times faster than other companies. While evaluating risks and return on investment, companies must adopt a perspective that prioritizes the needs of the market over the needs of its departments, fiefdoms, or leaders. Aligning the IT/OT ecosystem to solve the unmet needs of your customers ensures the best results in executing your DX strategy.

E. Identify quick wins and estimate benefits

There are always opportunities for quick wins by shedding light on pressing issues that erode operational performance - such as unplanned downtime or problematic equipment. A report by Aberdeen Research provides an example: organizations are expected to be hit with unplanned maintenance costs upwards of US\$260,000 per hour. Tackling these issues upfront, creates immediate and measurable benefits, freeing up valuable time for more strategic initiatives.

F. Build a stable technology foundation and organize your data

Leading companies ensure they have established a stable technology foundation before moving to cross functional integration and acceleration. In the early phases of DX, up to 80% of digitalization efforts were spent on janitorial and data housekeeping activities. An Experian report found 68% of their surveyed companies experience poor data quality issues, and while tedious, a clean and stable data foundation is essential to support effective analysis, decision making, and automation. In process industries, this often means securing the right data through devices, analyzing the data for new insights and using data to create business value. Only a data centered approach to technology can ensure a reliable foundation on which to apply analytics, application logic, and interoperability.

V. PARTNERING TO CREATE FUTURE-PROOF RESULTS

When done correctly, DX leads to future-proof results. DX is a daunting challenge with many interdependent factors, and there is not a one-size-fits-all solution. Process industry companies need a business partner who believes that innovation is not just a one-off event or project but a change in mindset, organizational culture, and business agility. The business partner should integrate business and domain knowledge with digital and automation technologies with customers to drive their digital transformation and operations and manufacturing.

Leveraging decades of experience in process manufacturing along with our digital fluency, we co-create value by connecting data, systems, and organizations to the value chain and business and domain knowledge.

There are numerous disruptive technologies and transformation paths; The business partner should guide, plan and implement the right one for your organization. Laying out your digitalization roadmap that thoughtfully considers people, processes, technology, assets, and data is the key direction to reorienting your business performance.

VI. CONCLUSIONS

As DX continues to disrupt, transform, and reshape global business, the imperative to change is clear and very present in process industries. To make this change, you will need to shift your focus from reactive operations to proactive, predictive, and profit-optimizing operations. Successful process industry companies see DX as a key strategy for deploying sustainable innovation across value chains through the judicious use of digital technologies, while structurally altering operational models, culture, and best practices that encompass new ways of working.

Companies cannot make the DX journey alone. They need to leapfrog innovation by partnering with experts fluent in both operational technology and IT. Your partner must understand your existing operations, technology, and data. As complexity differs for each company, the imperative is to co-create solutions that fit your needs, requirements, and budgets. Many solution providers have piece-meal offerings, including consulting, IT, and OT technologies. Increasingly, the best fit DX approach requires a partner who will support you throughout this journey, is open and oriented to all possibilities, and takes responsibility in all aspects of the process from planning to performance-based results.

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VIII. ABOUT THE AUTHOR



As an Energy Transition Business Executive in the field of industrial autonomy, Patrick Kools is working for Yokogawa for 5 years. In his role as a Sustainable Industry Leader, he is currently studying Sustainable Business at Cambridge University. And as a visionary speaker, Patrick brings people and technology together, with a particular focus on how our industry can keep up with global competition and helping the next generation to develop. Contact him via marketing@nl.yokogawa.com