

INDUSTRY X.0

UNLOCKING
THE **POWER**
OF DIGITAL IN
PLANT OPERATIONS

INTRODUCTION

Operational excellence and efficient, reliable and safe production are always top of mind for chemical company executives. And increasingly, digital technology is playing a key role in enabling significant and ongoing improvements to operations.

Digital technology has been reshaping industry after industry, but according to our research,¹ chemical companies have been latecomers to that revolution in the operations space. That is now changing. With industry executives clearly recognizing the financial benefits that digital offers to their plant operations, they are moving forward with a range of digital initiatives.

This perspective is a key finding from recent Accenture research into the use of digital technologies in chemical plant operations. With a survey of 360 executives from chemical companies across 12 countries, the research explored their views of smart sensors, cloud, artificial intelligence, analytics, wearables and other digital technologies in a plant environment.

This research took place at a time when there is a growing understanding of the real value inherent in the digital reinvention of industry—what Accenture calls Industry X.0 (see “Industry X.0 for Chemicals” sidebar). Accenture has determined that using technology to increase operational efficiency could save an average of \$91,261 per chemical company employee.² According to a study by the World Economic Forum and Accenture, the broader use of digital technology could bring the industry a \$550 billion benefit over 10 years—while reducing CO₂ emissions by 100 million tons.³ As that report noted, advanced digital technologies “will take core operational functions, including R&D, manufacturing and supply chain, to the next level.”

The industry is still in the early stages of realizing such benefits. This study of digital technologies within plant operations provides a perspective on where the industry is today and where it plans to go in the future—and offers insights into how chemical companies can focus efforts on their Industry X.0 journeys.



THE DIGITAL STATE OF THE INDUSTRY

Chemical companies have been deploying a wide range of digital technologies in the plant. But the leading digital solution being exploited today is analytics, with 67 percent of respondents either currently using it in production or running a pilot, and 27 percent defining an analytics strategy.

The use of analytics is a logical first step for chemical companies. For years, they have invested in automated operations, process controls, sensors and real-time data systems. Analytics is now enabling them to exploit the data they already have to deliver value to the business in a more agile and real-time manner.

However, the industry is not focused on analytics alone—chemical companies are using a variety of digital technologies. Rather than embracing any “silver bullet” technology, they are looking at harnessing combinations of Industry X.0 technologies to transform the way they work. Indeed, for most digital technologies, only 2 percent or fewer respondents said that the technology in question wasn’t relevant to their business.

INDUSTRY X.0 FOR CHEMICALS

Industry X.0 refers to the reinvention of industry by combining digital technologies to create smart, connected, living and learning operations. For some time, the adoption of digital technology has been expanding and accelerating in the consumer world. Now we are beginning to see increased use in the industrial world, as well. Businesses are starting to use advanced digital technologies to transform their core operations, their worker and customer experiences and, ultimately, their business models.

By harnessing the power of Industry X.0, chemical companies can release value trapped throughout their value chain while simultaneously taking advantage of the innovation and growth potential inherent in new, digitally-enabled business models.

The research also examined executives' expectations for the value the technology will deliver. In line with the levels of deployment, more than half of the respondents ranked analytics as the digital technology holding the greatest return on investment (ROI) potential, followed closely by artificial intelligence, cloud and smart sensors.

In addition to asking about ROI, the research also looked at executives' views of the strategic importance of specific technologies in various industry functions. While analytics and artificial intelligence both rank high across a relatively broad range of areas, executives see certain technologies as being especially important to specific functions:



ANALYTICS

Planning and scheduling, production execution and quality management.



ARTIFICIAL INTELLIGENCE

Maintenance, materials management/supply chain and production execution.



COLLABORATION AND SOCIAL TOOLS

Maintenance and environment, health and safety (EH&S).



ADVANCED PROCESS CONTROL

Planning and scheduling and quality management.



WEARABLES AND MOBILITY

EH&S and materials management/supply chain.

Interestingly, executives see robotics as having a strategic role primarily in production execution, with significantly fewer executives citing materials management/supply chain. This finding is somewhat surprising given the widespread use of robots in those areas. However, this lower ranking probably stems from the fact that packaging and movement of goods on the back end of production have already been automated significantly—meaning companies see less strategic value in bringing robotics to those areas in the future. At the same time, the technology's more prominent role in production execution is probably based on the availability of newer, advanced robots that are easy to program, highly versatile and suitable for use in hazardous areas of facilities.

Meanwhile, the view that analytics and artificial intelligence are strategic in several functions is likely due to those technologies' wide applicability and their ability to continuously deliver benefits over time. As more data is gathered, it drives improved machine learning and more effective artificial intelligence.

GROWING INVESTMENTS POINT TO FUTURE PRIORITIES

The research also examined how executives' evolving views of digital technologies are affecting investments and shaping budgets. The majority (80 percent) currently are investing more than they did last year. Seventy-three percent have boosted their investment by 25 percent or less, while 7 percent have increased it by more than 25 percent. Very few reported that they are now investing less.

Not surprisingly, almost half of executives said that analytics will be a key focus of their digital investments over the next three years. That emphasis is in keeping with executives' view that analytics offers both strategic benefits and higher potential ROI.

At the same time, however, chemical companies plan to distribute their investments across many digital technologies. For example, one-third or more cited artificial intelligence, advanced process control, cloud or sensor-based initiatives among their top investment priorities.

In terms of production functions being targeted by digital investments, two areas top the list:

1 PLANNING AND SCHEDULING

Planning and scheduling is the top priority for 23 percent of executives, while 52 percent said it is among their top-three priorities.

2 MATERIALS MANAGEMENT/SUPPLY CHAIN

With materials management, those figures were 18 percent and 62 percent, respectively.



By investing in planning and scheduling technology, chemical companies are addressing an area that has long been a challenge for the industry, especially for companies that have batch production and numerous changeovers. Improvements in planning and scheduling can be key to increasing utilization of production assets, enabling agile manufacturing and optimizing production across numerous plants to reduce costs.

DIGITAL INITIATIVES: PAYING OFF

Industry executives clearly feel that digital technology investments are money well spent.



37%

said that they are extremely satisfied, and that they have achieved all or most of the benefits that they expected from their digital initiatives.

92%

said they are satisfied with the outcomes of their digital investments.

76%

said that they have seen a 5 to 15 percent improvement in operations due to the deployment of digital technology.

When asked what kinds of improvements they've seen in plant operations, executives pointed to



MORE EFFECTIVE PLANT MANAGEMENT



REAL-TIME PROCESS OPTIMIZATION



IMPROVED QUALITY



FASTER PROCESSING/ REDUCED TIME TO MARKET

Improvements in those areas are especially significant, because they often help differentiate chemical companies in the market—enabling them to commit to weekly deliveries of a given product, for example, while offering lower prices.

The executives in the survey also pointed to **tangible financial benefits** they've achieved with the technology.

95%

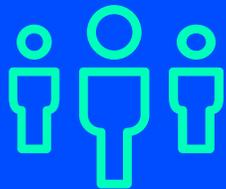
have been able to measure the financial value of digital technologies in their plant operations.

For example, in terms of operating profit, more than

HALF (55%)

said that they have seen increases of 5 to 20 percent. About one-quarter reported increases exceeding 20 percent.

Looking ahead, chemical companies plan to devote more funds to digital initiatives. That is not surprising given the impact digital technology has already had.



85%

of respondents expect their overall investment in digital to increase in the next three years.

ABOUT 3 IN 4

expect an increase of between 1 percent and 25 percent, and

1 IN 10

expect an increase of 25 percent or more.

CHALLENGES: MAINTAINING MOMENTUM

Chemical companies clearly intend to keep moving down the digital technology path in the coming years—but executives are not blind to some of the challenges involved. Asked about the biggest barriers to achieving greater business value with their digital efforts, they most often cited a lack of understanding of digital technology and a lack of maturity of digital technology.

Concerns about digital technology presumably stem from a lack of long-term industry experience with the technology, along with the rapid evolution of the technology, all of which results in uncertainty. Thus, the first of those barriers can be overcome by fostering greater awareness of digital use cases and building momentum by implementing successful examples in the company. The second—a lack of maturity in digital technology—is likely to be resolved as more digital providers emerge, “as a service” models become more mainstream, and platform providers begin to standardize and rationalize their offerings.

The third most-cited barrier was “inability to change people’s behavior.” Funding for digital efforts was considered an obstacle by only 13 percent of the executives.

Concerns about people’s behavior underscores the fact that as digital technology advances, executives understand that people in the organization will need to adapt—and people can be difficult to change. Other non-technology challenges identified by executives included a shortage of skills, difficulties in changing processes, company culture and lack of digital strategy. Experience across industries shows that these issues have become more of a barrier than the technology itself.

Chemical companies have been addressing some aspects of the organizational challenges. Most—81 percent—have merged their information technology (IT) and operational technology (OT) groups to create an integrated governance structure. Among those that have not done so, 70 percent are considering such a move. The two biggest benefits that executives foresee from IT-OT integration are greater system resilience, with less unplanned downtime, and improved incident management for tracking and responding to production problems.

As in every industry, cybersecurity is also a challenge. Here, chemical company executives said that the top two risks are operational reliability problems and commercial consequences, such as production loss or difficulties supplying customers. These were followed by data-breach issues such as loss of intellectual property or customer information.

Many chemical companies are tracking cybersecurity attacks in their production operations. Among those that do, three-quarters have experienced more than 30 attacks in the past 12 months. Digging deeper, the executives' responses indicate that there is significant room for improvement on the cybersecurity front. For example, while 44 percent of companies were able to remedy such attacks within a few hours, the rest were not, taking days, weeks or months to rectify the problem.

These figures are troubling enough, but the research found that 30 percent of companies are not tracking incidents at all in their plant operations—in other words, they have no idea how often their systems are successfully breached.

With its significant implications for safety and security, cybersecurity has long been a concern for plant operations. Historically, the OT environment has been largely “locked down” through the use of special protocols, point-to-point systems and closed-loop applications, such as distributed control systems. However, with a focus on “always keeping the plant running” and a desire to avoid risk to operations, much of the chemical industry OT environment has not been modernized to keep up with new threats or the evolving security methods seen in the IT side of the house. Combine this with the complexity of managing, in some cases, hundreds of OT legacy applications and the multitude of vendors required to support them, and it becomes clear that the risks are mounting as digital solutions are introduced into the environment.

The integration of IT and OT environments and governance structures will help, as it brings the mature, sound security practices typically found in IT to the OT arena. In addition, executives are also looking to digital technology itself to help, with more than 40 percent investing in tools for asset management/identification and incident management.

CONCLUSION

In reviewing these executive perspectives, one point stands out: the chemical industry is quickly moving from the discussion stage to the action stage of the digital revolution. Digital initiatives are underway at a variety of chemical companies, proving that digital technology can be a powerful tool in an asset-heavy industry.

At the same time, there is significant room to expand those efforts further, and apply digital technology more broadly.

According to Accenture's research, just 40 percent of chemical companies are using digital technologies to increase efficiency and 32 percent are applying digital technologies to drive growth. Only 11 percent are doing both.⁴

To ramp up digital efforts, chemical companies should consider six key business imperatives that can help guide their plans:

1

Transform the core

Digital technology can be used to strengthen, enhance and modernize legacy OT systems, and at the same time, enable companies to take advantage of new, advanced capabilities. The “old” and “new” can work in concert to drive new levels of operating efficiency—enabling companies to move forward without the wholesale replacement of technology.

2

Focus on experiences and outcomes

Companies can invest in digital to enable new, hyper-personalized experiences for industrial workers, as well as customers, and provide multiple “smart touchpoints” to engage them across channels.

3

Challenge existing operating models

With an understanding of digital capabilities, companies can reassess how the overall portfolio of assets can be made more flexible, responsive and efficient—that is, more competitive. They can then do the same at a more detailed level to determine how and where work should be performed in each facility.

4

Build a digital-ready workforce

It is becoming increasingly important to source, train and retain talent with digital-ready skills, and enable active collaboration between people and machines to enhance safety and sustained performance.

5

Re-architect ecosystems

Companies should develop and draw on a broad, robust ecosystem of suppliers, distributors, startups and customers to enable the rapid adoption and scaling of new digital solutions across the value chain.

6

Pivot wisely

Companies need to balance digital investments between the historical core business and the pursuit of the “new” in terms of solutions, products and services. The goal: synchronize the two areas to enable today’s success while driving tomorrow’s innovation and growth.





As companies continue to pursue their Industry X.0 journeys, they will undoubtedly continue to find new ways to drive operational excellence by combining the power of multiple digital solutions.

In Accenture's research, executives cited clear financial gains they have seen already from their digital initiatives. But they also pointed to long-term improvement—that is, transformation. Digital technology opens the door to disruptive change. The chemical companies that embrace Industry X.0 can use ever-evolving digital technologies to drive that change, rather than simply respond to it—ultimately positioning themselves for success in the years to come.

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RESEARCH METHODOLOGY

Accenture conducted an online survey of 360 C-level and top management executives and functional leaders in the chemical industry. The survey focus was on chemical companies that are currently leveraging digital technology in their core operations. The survey was fielded in mid-March through mid-April 2017 and included respondents from Canada, France, Germany, Japan, Netherlands, Saudi Arabia, Singapore, Switzerland, Turkey, the UAE, UK and US. The companies represented have total annual revenue ranging from US\$500 million to more than US\$20 billion.

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