

# How AI transforms the chemical industry



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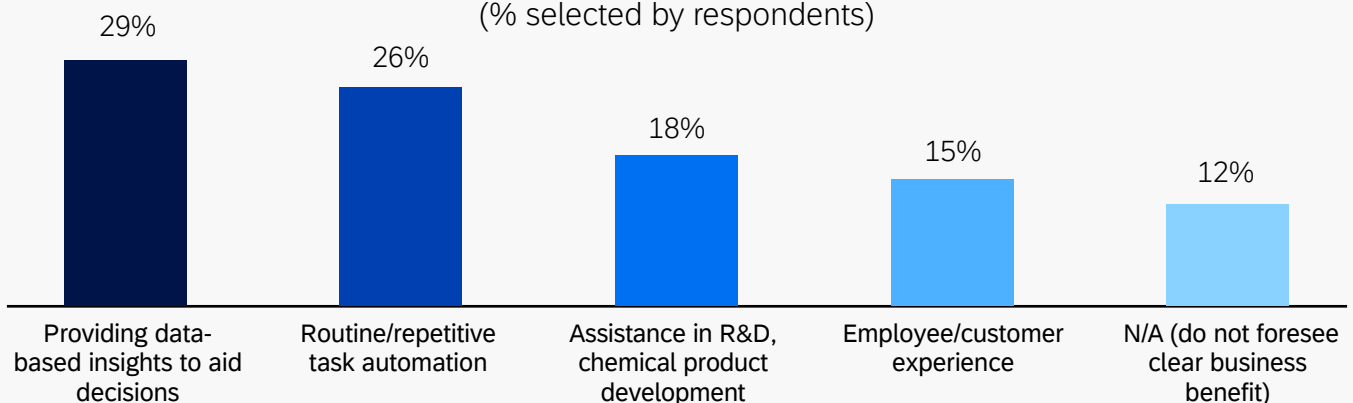
Amid growing market complexity, the chemical industry faces threats to margins but also great growth opportunities. Industry leaders say they're enthusiastic about AI-enhanced solutions to address both.

According to a survey conducted by newsletter publisher SmartBrief and software solution provider SAP, the vast majority of the industry – 94% of survey respondents – foresees growth via new capacity and products. AI's ability to process and analyze large amounts of data quickly can support the development of innovative products. For example, a chemical firm could use AI to search its research archives for possible chemical recipes that would comply with an ever-growing number of regulations and technical requirements. Almost a fifth of the surveyed American Chemistry Council newsletter readers say they would use AI to assist with research and development.

However, the most common foreseen AI use, favored by 29% of respondents, is to gain data-based insights to assist management. A firm could use AI to analyze unstructured external data to improve demand forecasting, for example. Survey respondents also report wanting to use AI to automate routine and repetitive tasks. These are better-known uses for AI, though that doesn't mean the emerging technology is well understood by decision-makers, which could slow adoption, says Sergey Nozhenko, who handles SAP's product management for chemicals. Other adoption challenges include a lack of available data

### Areas Envisioned for AI to Benefit the Chemical Industry

(% selected by respondents)







and concerns regarding the security of confidential and sensitive data, Sergey says. The greatest challenge, however, may be having a trustworthy way to know where best to use AI. This, however, is getting easier.

#### **AI is becoming more accessible.**

Incorporating AI into a business application software doesn't yield a new product but rather improves the existing one. Traditional AI uses machine learning to understand simple language commands, process documents and analyze large amounts of data. SAP's Marko Lange adds that while "there's nothing wrong with the classic AI models, they absolutely have their limitations."

As SAP's global head of chemicals, Marko appreciates where the technology originated but is more excited about the future.

"In the past, business [system] applications were primarily transactional. ... They were, so to speak, always asking for data, but it was always difficult to get data out of them. But now, with AI, you can *talk* with your system," Marko says. That's where AI-based user assistance comes in. It allows

systems to generate original reporting and content. Marko says SAP's standout AI solution for user assistance is Joule.

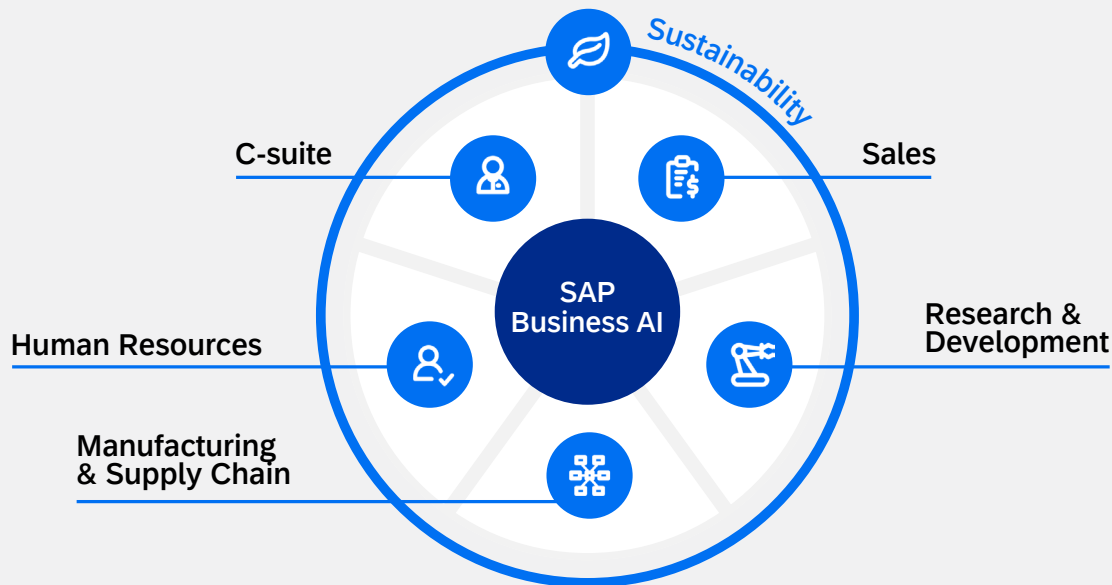
"You log in and you ask the system, 'Hey, I need all customers of project A or all products containing a certain substance of very high concern.' And it gives it to you. Next, you ask the system, 'Hey, I need suggestions on how to overcome a shortage of raw material C' and the system will show you how to solve this issue through production or purchase orders or stock transfer orders. So the way of interacting with the system is changing. It's much more like talking with a friend," Marko says. "In the past, you would have to create an SQL statement or write a report, and you would need to call your IT for this. A lot of technical know-how was necessary."

#### **Departments across a chemical industry firm can leverage AI.**

Some industry leaders – such as Michael Nilles of adhesives, detergents and cosmetics firm Henkel and Pierre Wiese of food additives producer Doehler – are ready to test what AI can do for their businesses. Nilles is Henkel's chief

## Chemical Industry

AI powered scenarios across business functions



digital and information officer. At the 2024 SAP for Process Industries conference in Vienna, Nilles noted that generative AI has the potential to “disrupt the economy and society similar to the internet – but at lightspeed.”

AI is just another technology, Doehler business apps leader Wiese said during the 2024 SAP DCOM online conference. However, its beauty is its agility.

“You come up with the business problem first and try to find the right solution. And by getting more possibilities from a technology in place, like [generative AI] and all the other AI cases and tools, of course, suddenly ... you can be more creative in solving and fixing those problems,” Wiese said.

### Sales

For example, sales departments can gain an advantage over the competition by better understanding customers. News feeds, industry reports and sales records can be analyzed, resulting in reports detailing potential sales volume and customer preferences. Additional analysis with

client-specific data could provide customized product recommendations.

Bespoke AI-enhanced systems created with platforms such as SAP’s Business Technology Platform streamline these processes, as well as account management. Parts of consulting-heavy services become automated, and select clients in a salesperson’s pipeline are highlighted as more urgent to approach. Customers benefit from not only more relevant proposals but also enhanced customer service. Thanks to using a system that organizes service tickets for quick reference during calls, call center operators access relevant information more easily. When accessing a customer website portal, an instant messaging system using natural language processing answers common questions.

### Research & Development

Customer and end-user insights intended for sales could also benefit research and development departments under pressure to create or improve products that can be brought to market





in time to meet revenue deadlines. Development costs, market potential and sales margins are forecast to ensure the right chemicals are advanced. Automated test result reporting supports collaboration among departments. Researchers might even work closely with surveyed customers, sharing and comparing data.

In the lab, AI combs through research data to suggest chemical formulations or recommend existing formulas to solve customer requests, perhaps based on natural language requests from a client or the marketing department, Sergey says. AI could also search patents and competitive products or even assist in modeling complex processes. The end result is a broader, more sustainable product range with added value and, more importantly, a shorter time to market, he says.

### **Manufacturing & Supply Chain**

Successful mass production of a new product, however, requires optimized operations and careful management of supply chains. On-site at the plant, AI can optimize nonlinear chemical production processes such as naphtha cracking. Maximum production output and minimum energy consumption considerations are balanced against the demand portfolio, process conditions, and raw materials volume and grades. Equipment health is monitored to prevent unplanned shut-downs, and routine office tasks are eliminated. Hence, the firm has more full-time-equivalent resources available to strategize and innovate.

## **High-level AI classifications**

### **Machine learning (ML)**

Computers “learn” from numerical, statistical, language or visual examples in the data without being explicitly programmed

ML can:

- Process low-structured documents
- Recognize images and sounds
- Analyze big multidimensional data to provide insights and highly accurate forecasts
- Process simple natural language

### **Subfields of machine learning:**

#### **Deep machine learning (DML)**

Uses specialized computational multilayer artificial neural network architectures

DML can:

- Perform similar tasks as ML but with much greater efficiency

#### **Generative AI (GenAI)**

Uses architectures with two competitive neural networks and leverages unsupervised training approaches, where the model self-learns to understand and generate new data without explicit labels or annotations.

GenAI can:

- Create original content (image, text, video, application code) based on human-provided and ML inputs
- Converse in natural language with translation capabilities
- Provide near-real-time results through the high power of a trained model running in high-performance data centers



## Human Resources

When skilled people are a limited resource, making the most of them and ensuring employees are engaged is especially important. Machine learning applications identify the strongest candidate resumes, onboard hires, power self-service employee websites and draft key performance indicators. Reporting is another task made simpler. AI can help HR managers track employee turnover rates and environmental, social and governance criteria.

## Sustainability

Environmental data often must be formally communicated to internal or external audiences. Much of this can be automated, as is the tracking of internal metrics including sustainability data such as energy and water consumption, carbon emissions and materials recycling, as well as external elements such as Scope 3 emissions.

“AI can extract and record sustainability-related data from business documents such as the percentage of recycled materials in supplier invoices. It also supports product development by incorporating sustainability criteria such as avoiding the use of fossil fuels in the new product recipe. Additionally, it can suggest hazardness classifications needed for logistics notifications and registrations,” Sergey says.

## The C-suite

While machine learning and generative AI can benefit all departments, the greatest beneficiaries may be those leading these departments and deciding company strategy. The American chemical industry is growing in complexity and regulatory oversight. Due to product commoditization and shifting customer demands, such as for more sustainable products, the industry also faces greater competition for products. Accurately forecasting market requirements, managing costs and developing chemicals requires AI-enabled software that supports innovative solutions. Programs using AI can provide:

- Financial data analysis and forecasts
- 360-degree customer and supplier analysis via executive briefs
- Supply and spend analysis
- Invoice and receivables management
- Market analysis





Sergey recommends chemical firms start their AI journey by fostering an AI-centric mindset and staying informed on AI advancements. The most important thing, though, is to start, Marko adds.

“True innovation does not start with business cases; rather [with] trying things out,” Marko says. “Get a grip on AI by practicing it first since those experiences are a prerequisite to calculating a business case for further expansion into AI. Starting with a business case before stepping into such a new technology will prevent you from doing anything.”

## About

SAP supports chemical companies in becoming intelligent enterprises – providing integrated business applications that use intelligent technologies and can be extended on SAP Business Technology Platform to deliver breakthrough business value. For information about SAP solutions for the chemicals industry, please contact your SAP Partner.