



WHERE DO CHEMICALS MANUFACTURERS LAND ON THE INDUSTRY 4.0 MATURITY INDEX?

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Michael Lerner
Research Director

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INDUSTRY 4.0 MATRIX FROM ABI RESEARCH AND NOKIA

Industry 4.0 encompasses optimizing equipment, operations, workflows, and staff capabilities, while also operating in a safe and sustainable manner. To achieve these objectives, chemical manufacturer must deploy a mix of hardware, software, and connectivity solutions that complement one another. But to maximize the benefits requires alignment between those with responsibility for delivering Information Technology (IT)-based solutions to the organization and those with responsibility for Operational Technology (OT) that support use cases such as digitizing workflows.

The focus of this whitepaper is an Industry 4.0 Matrix Index that ABI Research and Nokia have created highlighting the progress made by chemical manufacturers with respect to the alignment of their investments in IT infrastructure and the deployment of use cases underpinned by digital technologies at their facilities.

The Industry 4.0 Matrix Index shows where plans can go awry. Upgrades to IT infrastructure should be synchronized with the use cases being deployed. Additional use cases will place an extra load on the IT infrastructure, risking poor performance. Alternatively, spare IT capacity wastes scarce budgets.

The Industry 4.0 Matrix Index is informed by the results of an online survey of 500 individuals that took place in 1Q 2023. All respondents were involved in either devising the overall strategy, the program design, or on-site implementation of digital transformation projects at their company's factories/plants/industrial sites/facilities. The sample included 100 respondents working in the chemicals industry; other respondents were from the fabricated metals, mining, oil & gas, heavy machinery, electronics, and appliances sectors, or port operators. Respondents were either in the United States, Japan, France, Germany, or the United Kingdom. In addition, the sample was a mix of IT and OT leaders, and senior managers whose companies operate out of a single location or dozens of sites and employ hundreds or thousands of employees.

EXECUTIVE SUMMARY: CHEMICAL MANUFACTURERS MUST PRIORITIZE ALIGNING THEIR IT AND OT ENVIRONMENTS TO TAKE ADVANTAGE OF INDUSTRY 4.0

Chemical manufacturer need to maximize the throughput at their facilities and are focusing on improving the performance of their equipment via condition-based monitoring, as well as the capabilities of their staff members.

These measures must not compromise the need to ensure safety levels across the facilities. Chemical manufacturer have looked to investments in mobile devices to improve staff members' ability to work remotely and take advantage of cloud-based applications. Chemical manufacturer are also prioritizing investments in data analytics to improve the performance of their equipment, identify the root cause of issues, and optimize their operations.

The Industry 4.0 Maturity Index suggests that chemical manufacturers have made good progress in deploying OT; however, there is a risk that their technology infrastructure cannot necessarily support additional use cases if it does not advance further. One way to do this would be to scale investments in campus networks and private 4G.

Respondents acknowledge that a lack of alignment between IT and OT teams holds back investments and delivery of digital transformation projects.

FOR CHEMICAL MANUFACTURERS, KNOWLEDGE RETENTION AMONG STAFF MEMBERS WILL BE CRITICAL TO REDUCING PRODUCTION TIMES, WHILE IMPROVING QUALITY LEVELS

Chemical manufacturer seek a range of outcomes for their Industry 4.0-related investments to tackle their short-, medium-, and long-term challenges. Respondents were asked to score the extent to which a particular topic is currently a focus of attention.

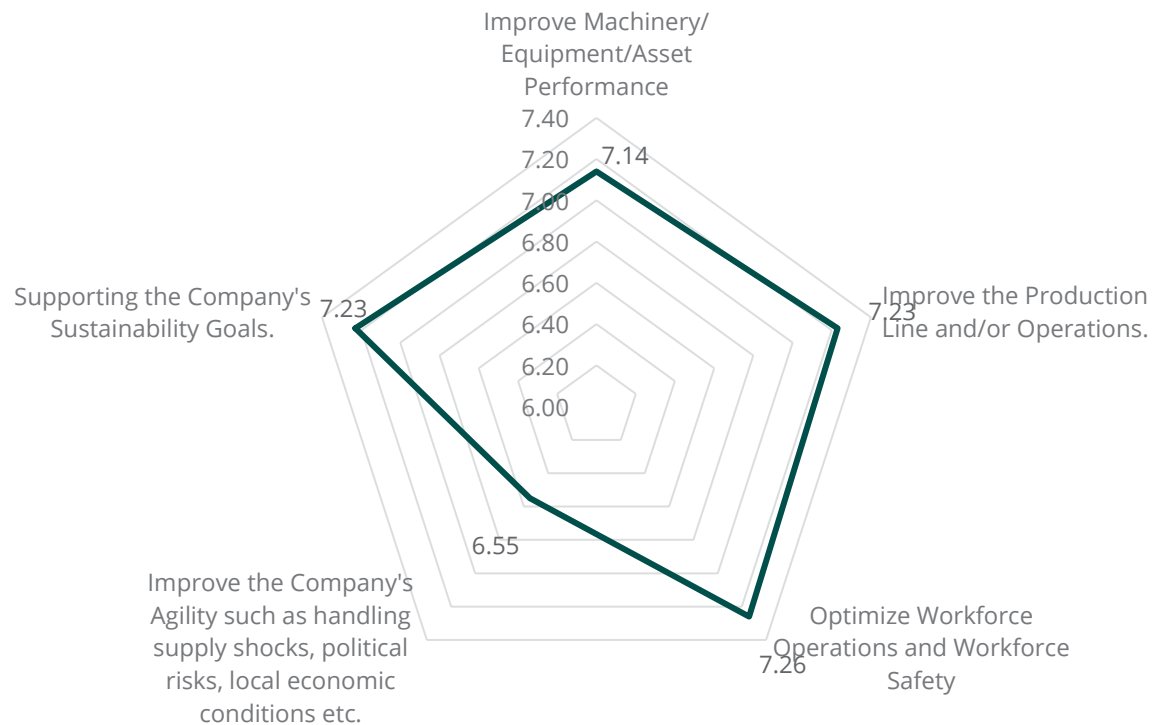
The focus areas included:

- Improving machinery/equipment/asset performance
- Improving the production line and/or operations
- Optimizing workforce operations and workforce safety
- Improving the company's agility, such as handling supply shocks, political risks, local economic conditions, etc.
- Supporting the company's sustainability goals

The spider diagram in Figure 1 contrasts the extent to which the topics are a focus of attention.

Figure 1: Priorities for Chemical manufacturers

(Source: ABI Research)



N = 100. On a scale of 1 to 10 (where 1 is not important at all and 10 is an urgent priority/critical to the company), please score the extent to which the following are desired outcomes from investments in Industry 4.0 digital transformation.

Chemical manufacturer are an essential element in the production of hundreds of different products, so they need to avoid being a bottleneck for customers' operations. The quicker the chemical manufacturer can provide products that meet their customers' requirements, the better. Respondents report that digital transformation projects are now part of their firms' corporate as well as IT strategies.

Chemical plants can often cover large areas with lots of pipes and hazardous materials, risking worker safety. Optimizing the workforce to improve throughput, while ensuring their safety is a key concern for chemical manufacturers. Respondents answered that an important measure for meeting these challenges is improving knowledge retention among staff at their facilities.

Tied to the concern for workforce optimization is their concern around the performance of their operations. Of particular interest, and tied to the need to meet customer requirements, is automating many of the procedures inside the facilities, often as part of the effort to improve quality levels. Respondents were also focusing on improving production times and increasing the life span of their equipment with condition-based monitoring.

Sustainability was of equal importance to improving operational performance, with respondents looking to reduce energy consumption at their facilities.

Organizational agility was of lesser concern; however, chemical manufacturer are looking to support their operations and clients with better supply chain visibility. The desire to improve quality and knowledge retention among staff members is influenced by labor shortages in the industry.

TECHNOLOGY MATURITY

Survey respondents were asked to indicate their current thinking and progress made concerning their IT infrastructure (Wi-Fi, private wireless, campus networks, devices, edge compute, and cloud) on a 10-point continuum. At one extreme, the respondent had no plans for investing in the technology for the foreseeable future (0) and at the other extreme, they were exploring/evaluating the next iterations of the technology (10).

The survey responses indicate that chemical manufacturer are committing budgets to each area of IT infrastructure in the next 12 months and that mobile devices (smartphones, tablets, ruggedized devices) have already been implemented at all applicable facilities as part of their endeavors to improve collaboration and knowledge retention.

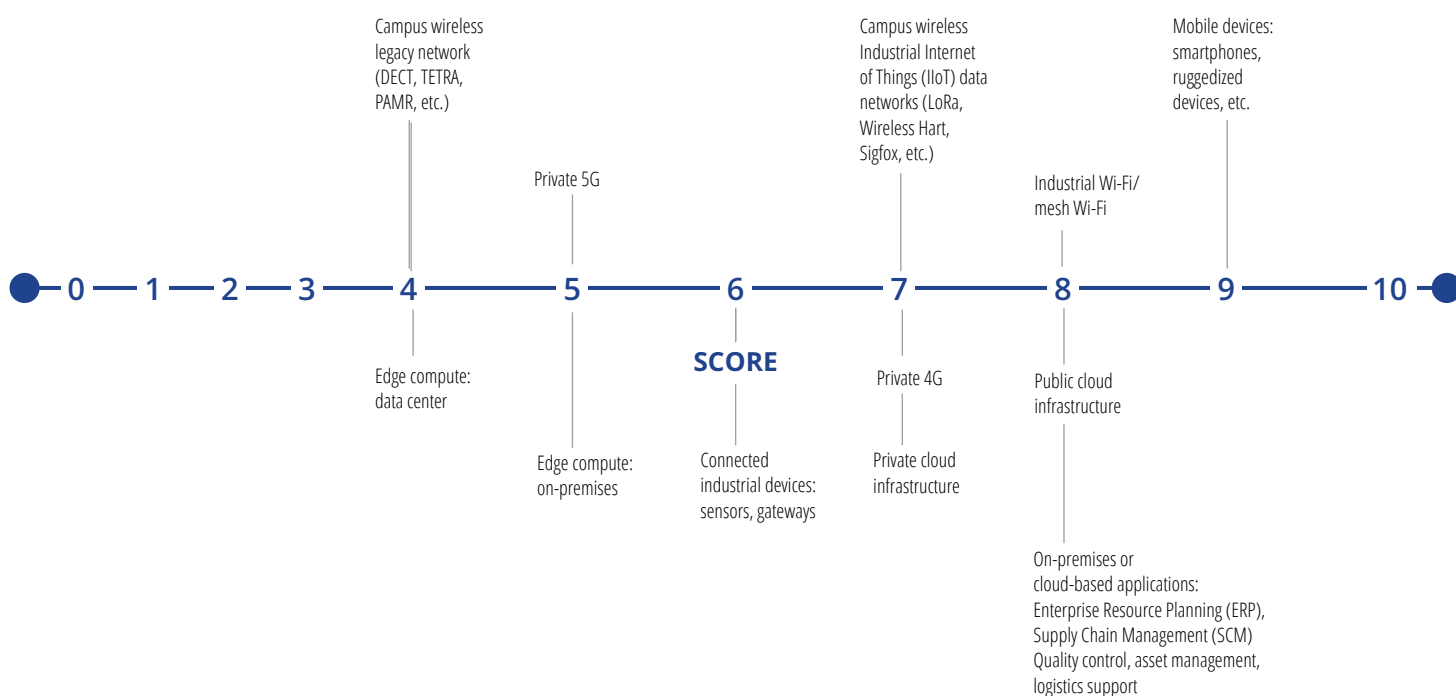
Figure 2 shows the median scores for each IT investment area.

Figure 2: IT Investments and Plans

(Source: ABI Research)

THE INVESTMENT LIFECYCLE

Score	Comment
0	No plans for the foreseeable future
1	Possibly consider in the next 5 years
2	Possibly consider in the next 2 years
3	Considering adoption in the next 12 months
4	Evaluating a proof of concept
5	Evaluating suppliers
6	Devising implementation program of the technology
7	Initial rollout at a limited number of factories/plants/facilities
8	Scaling technology across our factories/plants/facilities
9	Technology has been implemented at all applicable factories/plants/facilities
10	Exploring/evaluating the next iterations of the technology



OPERATIONAL TECHNOLOGIES AND USE CASES DEPLOYED

Operational teams are deploying a wide range of technologies to support the objectives of workforce optimization and improving facilities' operations. As highlighted above, chemical manufacturer have been providing staff with mobile devices that support the desire to enable remote working and deploy industrial applications, such as Product Lifecycle Management (PLM), and software to underpin quality improvements and their supply chains. In addition, chemical manufacturer are investing in drones as part of their inspection processes.

In terms of use cases that support the desire to improve the life span of their equipment, the survey indicated that Three-Dimensional (3D) printing parts and investing in predictive maintenance are priorities for chemical manufacturers. When it comes to using data analytics, respondents from chemical firms were performing analytics to underpin video-based quality inspections, as well as to identify solutions to operational issues that arise.

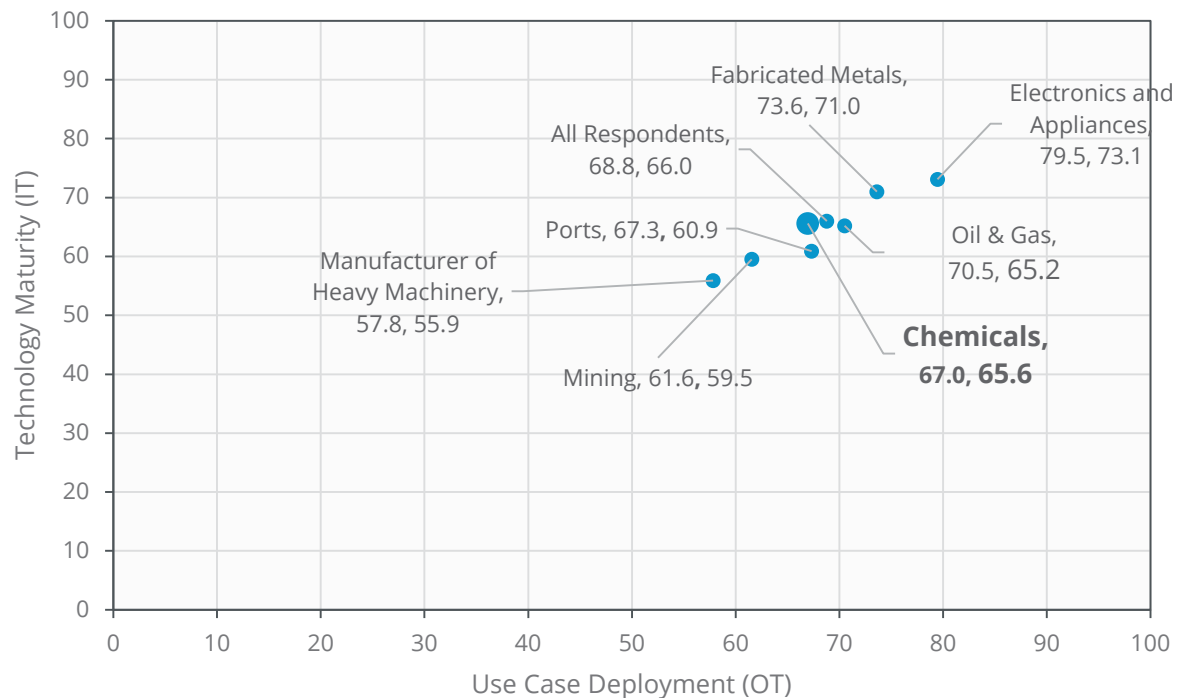
INDUSTRY 4.0 MATURITY INDEX

The Industry 4.0 Matrix Index brings together respondents' answers concerning their investments in IT infrastructure and deployment of use cases. The answers to questions related to the two previous sections are wrapped into weighted scores for IT maturity and use case deployment. These scores generate a grid reference to plot the vertical in the chart. The index not only showcases progress made, but also highlights whether the IT and OT environments are in alignment.

Figure 3 shows that chemical manufacturer are close to the average score for all respondents. The sector is behind the electronics & appliances firms, which are the most advanced in their deployment of use cases and IT investments.

Figure 3: Industry 4.0 Matrix Index by Vertical

(Source: ABI Research)

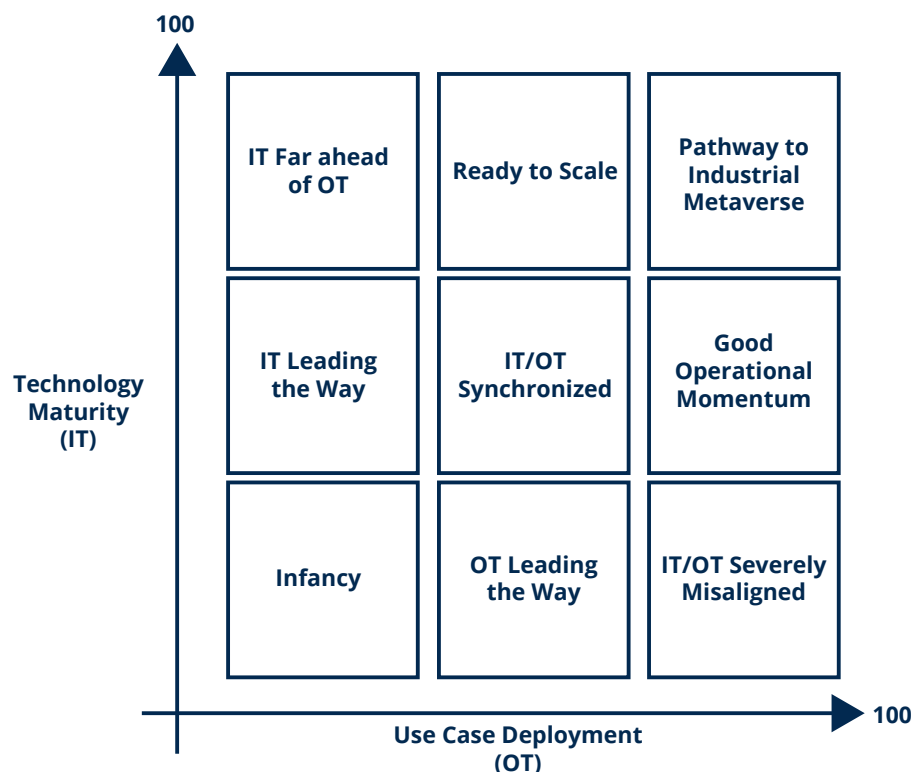


Charts and indexes can portray that devising, implementing, and harnessing digital transformation projects is a straightforward crawl, walk, run process. But in reality, there are numerous pitfalls along the way. The online survey asked respondents to rank the barriers to investing in and delivering digital transformation projects. Respondents from the chemicals industry answered that they lack alignment between IT/OT teams to deliver projects.

In addition to developing the Index, ABI Research and Nokia have summarized respondents' positioning in nine different segments.

Figure 4: Industry 4.0 Matrix Index—Status Summary

(Source: ABI Research)



You may now benchmark yourselves using the self-assessment tool co-created by Nokia and ABI Research: <https://pages.nokia.com/T008UQ-Industry-4-0-Maturity-Assessment.htm>.

Those in the bottom left corner are only just beginning to invest in their IT infrastructure and to deploy use cases in their facilities, while those in the top right corner are well on the way to achieving self-learning operations that run with little human involvement and eventually engage in the industrial metaverse. In both scenarios, the IT and OT investments align. But as companies scale, IT and OT environments need to maintain that alignment; otherwise, the IT or OT environments get ahead of one another and move too far to the left or to the right. The sweet spot is in the middle with the investments maintaining alignment and the IT infrastructure supporting the increasing numbers of use cases.

Previous sections have highlighted how chemical manufacturer are investing in software and data analytics to support plans to optimize their equipment and operations overall to meet customer demands. However, respondents are typically only rolling out campus wireless IIoT data networks, private 4G, and private cloud infrastructure at a limited number of facilities.

While the chemical manufacturer have achieved good operational momentum on deploying use cases, there is a risk that their technology infrastructure will soon be unable to support those use cases.



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157 Columbus Ave, 4th Floor

New York, New York 10023 USA

Tel: +1 516-624-2500

www.abiresearch.com

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