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Cracking the labor productivity conundrum in the chemical industry

How to grow revenue without increasing headcount

Executive summary

Cracking the labor productivity conundrum in the chemical industry

The chemical industry has a golden opportunity to drive growth from the transition to a low-carbon economy, as demand for sustainability-related products is predicted to soar by about 70% by 2028. However, the industry faces a significant challenge in labor productivity,[i] which has failed to improve by more than 1% per year during the last 15 years. If this trend continues, chemical companies will be unable to meet additional demand and increase revenue as they will lack the talent for growth.

Labor productivity has remained low despite substantial investments in new plants, better equipment, digital technologies and continuous improvement. In contrast, several other asset-intensive industries have achieved up to six times greater improvements in labor productivity in that same period.

Looking ahead, labor productivity will become an even bigger challenge for chemical companies as two pressing issues converge: the retirement wave and talent shortages. Around 30% of employees in the industry are 50 years of age or older, with many due to retire within the next decade. Additionally, student enrollment in key disciplines such as engineering and business is declining, further shrinking the talent pool.

Chemical companies can crack the labor productivity conundrum by reinventing roles and reshaping the workforce to adapt to technological improvements. These changes include restructuring work to unlock untapped productivity gains; building the expertise to continuously adapt as technology advances; and investing in dedicated training and knowledge capture and transfer.

The rapid pace of technological advancements presents a new world of possibilities, but many companies struggle to effectively implement these changes. As chemical companies explore future advancements in technologies—including AI and automation—they must continue to reshape roles, skills and organizational structures to fully benefit from them.

The bottom line is that realizing labor productivity potential will be decisive for business continuity and future growth. It's time for chemical companies to seriously address labor productivity, tackling it from the board-level down. By doing so, they will be well-positioned to address talent challenges and drive growth in the transition to a low-carbon economy.

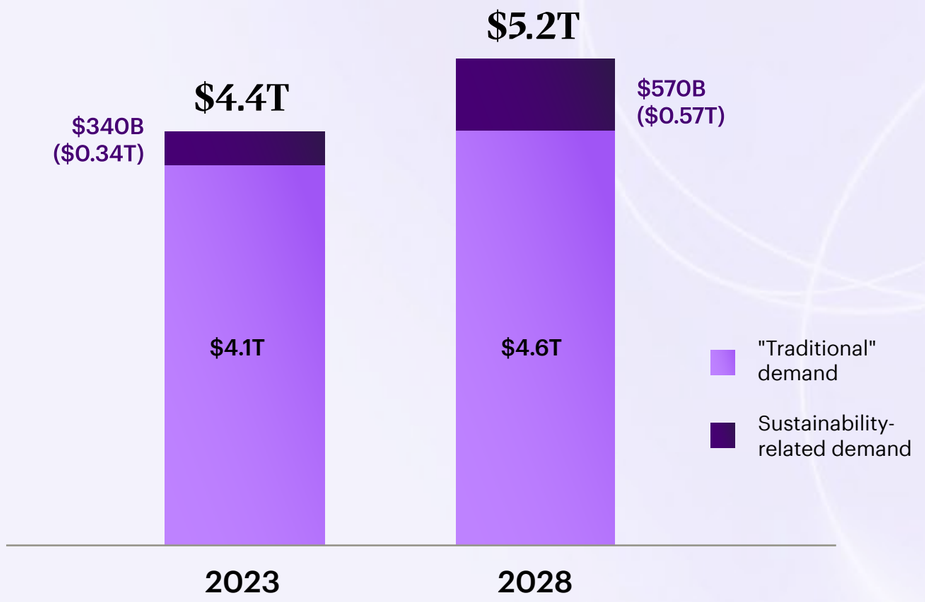
Green economy, golden opportunity

As the world transitions to a low-carbon economy, chemical companies face a golden opportunity to drive growth: Demand for sustainability-related products is predicted to increase from $340 billion in 2023 to $570 billion by 2028.[ii] This represents an increase of approximately 70%, with a compound annual growth rate (CAGR) of 11%.

The surge in demand encompasses both sustainability-enabling products, such as materials for wind turbines and solar panels, and products involving sustainable manufacturing, such as bio-based products or goods made from recycled materials.[iii] These products play a role in helping chemical companies and their customers meet sustainability commitments, net-zero targets and the UN Development Goals.

This growth in sustainability-related demand supplements demand for traditional products, which is also set to rise. With a CAGR of nearly 3%, traditional demand is projected to grow by more than $500 billion by 2028.[iv]

Sustainability-related demand is expected to show hypergrowth with a **CAGR of 11%**



Note: Chemical market based on Oxford Economics chemical sales in real US$: 2023 US$4.4T, 2028 US$5.2T, difference US$800B.

Source: Accenture Research based on market reports, Oxford Economics

The challenge: stagnant labor productivity

To capitalize on this growth opportunity, however, chemical companies must first overcome a substantial hurdle: Labor productivity, measured as revenue per full-time equivalent (FTE), has stalled.

Chemical companies' productivity has remained flat for more than a decade, which essentially means that they are unable to meet additional demand and increase revenue as they lack the talent for growth. So far, their efforts to boost productivity haven't had the desired effect.

Across the industry, revenue per FTE has improved by less than 1% per year during the last 15 years.[v]

This lackluster level of labor productivity is surprising, given that chemical companies have invested up to 6% of their annual revenues[vi] in new plants, better equipment, digital technologies and continuous improvement.

Across 15 years, this substantial investment has provided a significant upgrade of chemical assets and plants. However, despite these improvements, productivity has remained disappointingly low.

Labor productivity stagnant for 15 years for chemicals

Note: Labor productivity calculated as revenue per full-time equivalent (FTE).

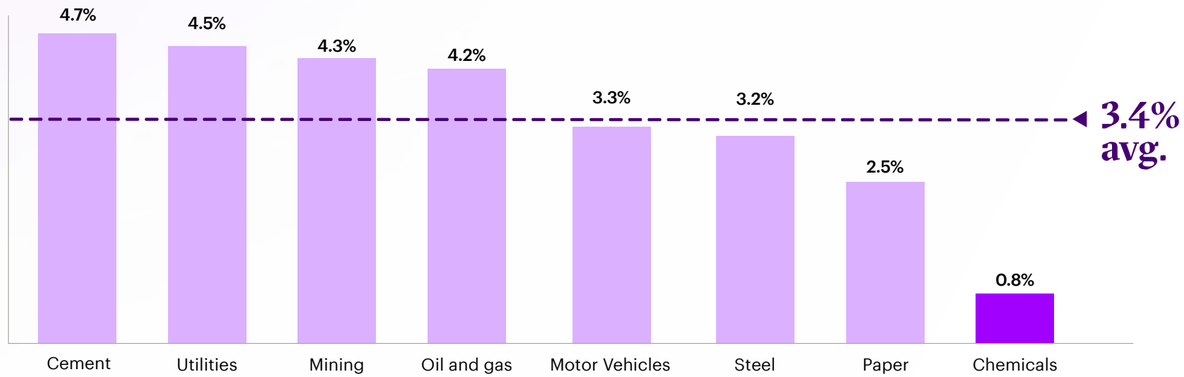
Source: Accenture Research analysis of 79 chemical companies publishing full 15y data, Capital IQ, Revenue as reported in local currency, excludes fertilizers

Chemical industry trails other asset-intensive sectors

Meanwhile, other asset-intensive industries have made progress on the productivity front.

The paper, steel and motor vehicle industries have achieved roughly **three to four times higher** labor productivity gains compared to the chemical industry.[vii] And other sectors have made even greater improvements. Frontrunners such as the cement, utilities, mining, and oil and gas industries have attained **five to six times greater labor productivity improvements** than the chemical industry.[viii]

Labor productivity CAGR 2008-2023 by industry, %



Note: Labor productivity calculated as revenue per full-time equivalent (FTE). Considered top companies in each sector with 15 years data (excl. extreme outliers with CAGR larger than Factor 2 or 3 [for e.g., Türkiye]); Revenues as reported.

Source: Accenture Research analysis of top 257 companies publishing full 15y data, Capital IQ, Revenue as reported in local currency

Forecasted talent shortages create a perfect storm

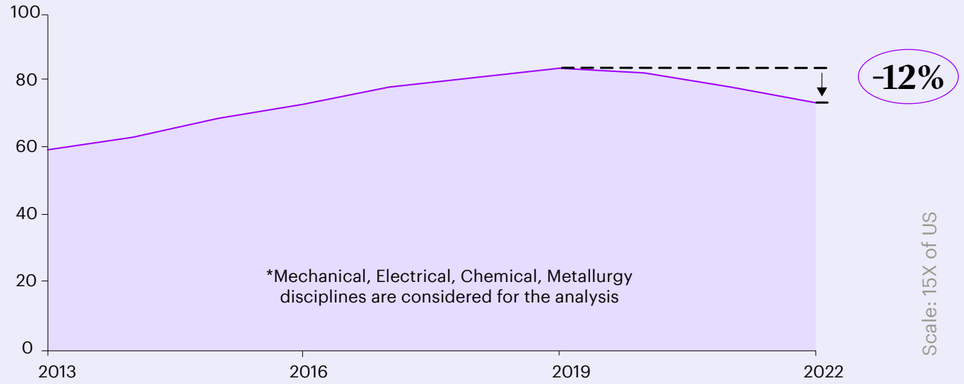
Looking ahead, stagnant labor productivity is likely to become an even bigger challenge for chemical companies as two pressing issues converge.

First, chemical companies will be swept by waves of retirement, as around 30% of employees in the industry are 50 years of age or more and due to retire within the next decade or so.[ix]

Second, there are shortages at the other end of the talent supply chain, as student enrollment declines in key disciplines for the chemical industry such as engineering[x] and business.[xi] The engineering shift is especially pronounced in the US. However, it's also noticeable in other talent pools such as India, which has historically served as a key source of engineering talent. The decrease means chemical companies will face challenges recruiting the skills they need and replenishing the retiring workforce.

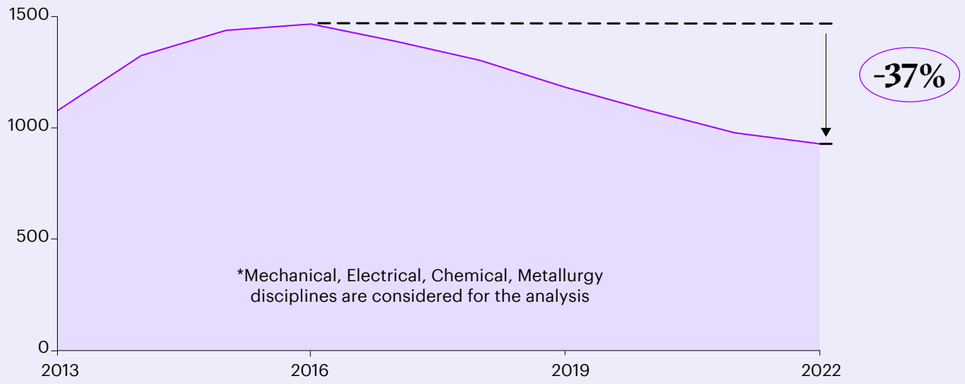
Enrollment in engineering programs declines

US Engineering* Degree Awarded, thousands

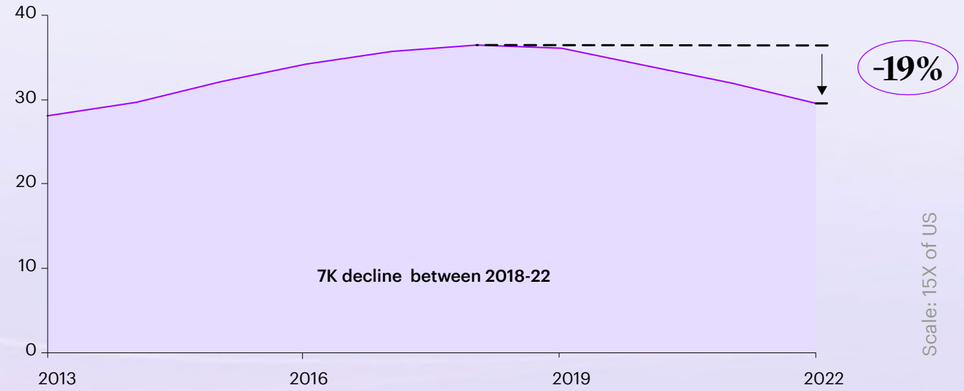


Scale: 15X of US

India Engineering* Enrollment, thousands



US Electrical & Chemical Engineering Degree Awarded, thousands



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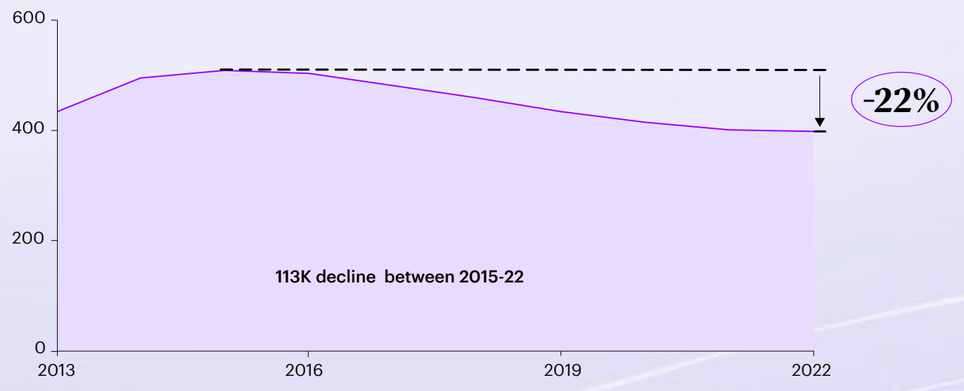


*Note: Degree awarded/enrollment considered at all levels (Bachelors, Master and PhD.) and adjusted for students who pursue higher education (Bachelors to Masters or Masters to PhD.) to avoid double counting.
Source: American Society for Engineering Education (ASEE) – US; All India Survey on Higher Education (AISHE)-Department of Higher Education – India

How to crack the labor productivity conundrum?

Other asset-intensive industries have demonstrated that capital expenditures can be converted into greater labor productivity, so what do chemical companies need to do differently to achieve the same or even better results?

> The reality is, even though chemical companies have invested up to 6% of their annual revenues in new technologies and equipment,[xii] approaches to labor have remained largely unchanged.

Consequently, new plants operate in much the same manner as their older counterparts, with minimal improvements in automation and efficiency. Likewise, in support services and corporate functions, there's little indication that investments in digitization, automation or robotics have enhanced labor productivity.

Ultimately, technology alone does not automatically lead to greater labor productivity. In parallel, companies need to adjust work processes, methods and roles to adapt to tech advancements. Furthermore, chemical companies must reconsider their recruitment and training strategies to accommodate rising demand for new skill sets in areas such as gen AI, data science, engineering and other relevant fields. This comprehensive approach is crucial for boosting productivity and mitigating the impact of the impending retirement wave.

The good news is that chemical companies already have the technology they need to increase labor productivity and address talent challenges.

Chemical companies should make substantial productivity improvements by reinventing roles and reshaping the workforce across three dimensions:

1. **Restructuring work to increase labor productivity**
2. **(Re-)Building the expertise to continuously reorganize work**
3. **Investing in dedicated training and knowledge capture and transfer**

Dimension 1:

Restructuring work to increase labor productivity

When chemical companies build new facilities, they often replicate existing plant designs and organization charts. And when they invest in digital programs, they typically do not reinvent or restructure roles. Without adjusting work processes, methods and roles, new technologies spark only small, incremental improvements, and companies miss out on larger productivity gains.

As an example, imagine that a company has invested in a technology that can automate 20% of a role. If the work isn't reorganized, the people in the role will do something else with the time gained. But if the company combines roles, it can free one FTE position for every five workers. And that really adds up. If companies can save a few hours for each person across several thousands of roles, they will **achieve considerable savings and reduce the need to replace employees as they retire, easing pressure on recruitment.**

Capturing the value of time savings across thousands of roles requires a dedicated effort. The first step involves examining the benefits that a tech investment promises in the business case. Then companies can:

- map the tasks by role to gather detailed information for reorganizing work
- adapt and standardize the role profiles
- deliver the time savings
- provide training to make sure workers are skilled in all the new tasks that their roles will entail.

Companies should use this approach to confirm that both past and future capital expenditures deliver the value promised in the business case.

Dimension 2:

(Re-)Building the expertise to continuously reorganize work

Leaders can’t approach reinvention as a contained effort undertaken every few years. Change is constant, so reinvention never ends. Leaders need to build the capability to continuously adapt and reinvent as technology advances and creates new possibilities.

As an example, chemical companies can look at the Lean Six Sigma continuous improvement programs run in the past. They should implement similar efforts, rebuilding and tailoring them to the functionality and productivity gains offered by new technologies.

Driving efficiencies from new technologies requires companies to put in place people with the capabilities to reorganize work on a role-by-role level, build new teams and unlock labor productivity potential. For instance, if a new technology creates time savings for a certain role, then that role can either be given additional tasks or the number of FTEs can be reduced to make sure the freed capacity is used for value-added tasks. Implemented successfully, these kinds of changes should reduce the number of FTEs required to run each plant or function.

Ideally, the people tasked with reorganizing work will sit in a dedicated unit, supported by a mandate from the C-suite and by dedicated C-level ownership. Leaders with the skills to reinvent how people work with new technologies and how the organization is structured will be crucial to successfully improving labor productivity.

Dimension 3:

Investing in dedicated training and knowledge capture and transfer

Chemical companies need detailed plans focused on: identifying required skills and building them via training; capturing knowledge from retiring employees; and conveying that knowledge to new employees or those taking on new roles.

As job profiles change and consolidate, employees in these positions must be trained to handle new responsibilities. This shift will affect the entire workforce, as new technologies have influenced almost every role in the company. However, low-skilled, manual jobs will be particularly affected, as many of their routine tasks become automated and digitized.

New technologies also bring new functionalities and require additional skills—for instance in analytics, data science and automation. To bridge this skills gap, chemical companies need to establish substantial training programs that enable employees to adapt to and work with new technologies. As an example, setting up academies to provide data science training for plant engineers.

Since labor productivity opportunities affect all business divisions, functions and roles, almost every employee will require some level of training or skilling. To address this need, companies must undertake structured capability-building initiatives on a much larger scale compared to current training programs.

These initiatives will drive a **broader shift in the chemical industry, moving away from transactional, manual labor toward work focused on analysis, design and execution.** On a practical level, this change could mean transitioning from an employee conducting operator rounds in the field to managing a plant from afar using remote supervision, analytics, AI and automation technology.

It's also vital to establish knowledge capture and transfer plans for employees nearing retirement to preserve valuable insights gained from their years of experience. Companies can draw on gen AI for help, using large language models (LLMs) to interview retiring employees and to document their expertise in handling specific situations and challenges. This approach will help preserve and transfer important knowledge within the organization.

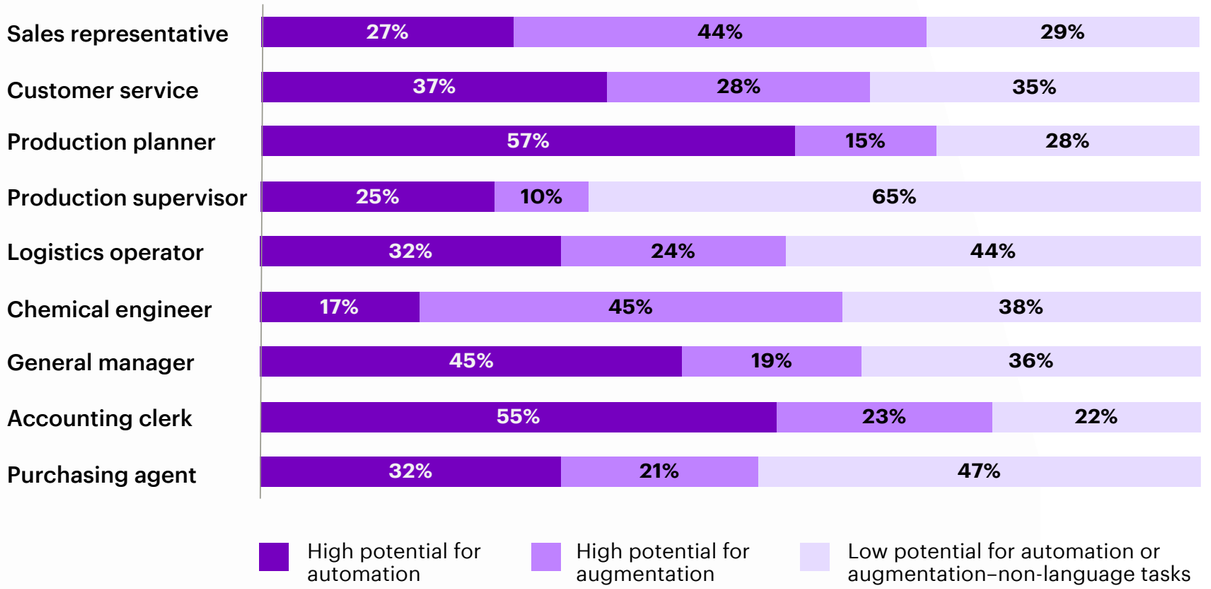
Looking ahead: the impact of new technologies

Technology is advancing at an exponential rate, providing new opportunities. However, most companies struggle to effectively implement and absorb these changes. As chemical companies explore new technologies—including AI, automation and gen AI—they must continue to reshape roles, skills and organizational structures to fully benefit from them.

For example, companies can provide training and restructure work to allow gen AI to take on the routine tasks that largely occupy the chemical industry's workforce today. This shift can enable employees to focus on more creative and meaningful work. Production employees, who make up almost half of the workforce, spend 90% of their time on transactional matters and tasks involving simple judgment and only 10% of their time on complex judgmental tasks.[xiii] Effectively using gen AI could allow them to reinvent their roles and learn new skills.

At a broader level, gen AI has the potential to revolutionize work and workflows across the entire value chain. Our research indicates that **gen AI will affect about 31% of working hours in the chemical industry through automation or augmentation.**[xiv] This large potential is likely why 97% of leaders in the chemical industry believe that gen AI will positively affect their company's market share in the next three years.[xv]

Gen AI's potential impact on common roles at chemical companies



Source: Accenture Research analysis of data from the Occupational Information Network (O*NET) and the U.S. Bureau of Labor Statistics

To fully reap the benefits of gen AI, chemical companies will need to address four important points:

- **Equip executives with the skills and capabilities to lead in new ways.** They will need to guide the organization through reinventing processes, reshaping the workforce and preparing employees for gen AI. Currently, only 20% of leaders in the chemical industry feel equipped for this transformation.[xvi]

- **Involve employees in rethinking business processes and workflows to effectively use gen AI.** They know the work best and can help design and implement gen AI tools.

- **Update employees' skill sets.** Currently, only 4% of chemical companies are providing comprehensive training to prepare workers for the impact of gen AI.[xvii]

- **Connect disparate data sets and technologies** through an AI-enabled, secure digital core.[xviii]

By updating skills and restructuring work to adapt to new technologies such as gen AI, companies can increase efficiency and drive a fundamental shift in organizational operations and labor productivity.

A critical turning point

As experienced employees retire and the talent pool shrinks, it won't be possible for chemical companies with stagnant labor productivity to thrive—and especially to capitalize on rising sustainability-related demand. The bottom line is that realizing labor productivity potential will be decisive for business continuity and future growth.

Organizations can ill afford to continue relying heavily on transactional and manual work. It's time for chemical companies to seriously address labor productivity to capture the advantages of current and future technologies. From the board-level down, prioritizing reinventing roles and reshaping the workforce to adapt to technological advancements will be essential to driving growth and prospering in the next chapter of the chemical industry.

Authors

Dr. Bernd Elser,
Senior Managing Director, Global Chemicals & Natural Resources Lead, Accenture

Ojas Wadivkar,
Managing Director, North America Chemicals Lead, Accenture

Serge Lhoste,
Managing Director, Global Chemicals Strategy Lead, Accenture

Ashley-Rachelle Horstman,
Managing Director, North America Chemicals Strategy Lead, Accenture

Contributors

Sachin Kumar Chaudhary,
Global Lead, Chemicals and Natural Resources Thought Leadership & Research, Accenture

Dr. Karin Walczyk,
Global Chemicals Research Lead, Accenture

Special thanks to:

Ganesh Patro, Jaswin Ratti, Asako Sakuma, Gaurav Sharma, Julia Plonka, Sandra Najem, Rashmi Bhimrao Wankhede, Himanshu Patney, Asmeeta Dewari, Priya Verma, Regina F. Maruca.

About the research

Accenture Research analyzed labor productivity, measured as revenue per full-time equivalent (FTE), across chemical and other asset-intensive sectors such as cement and steel from 2008 to 2023. Additionally, capital expenditures in the chemical industry were analyzed for the same timeframe. This global study sourced data from market reports by Oxford Economics and Grand View Research, S&P Capital IQ Pro, chemical company reports, news releases, the American Society for Engineering Education (ASEE) and the All India Survey on Higher Education (AISHE). Insights were also drawn from the research conducted for our publications, “Where’s the money in sustainability for chemical companies,” “Work, workforce, workers: Reinvented in the age of generative AI,” and “Reinvention in the age of generative AI."

Learn more: accenture.com/LaborProductivity and accenture.com/Chemicals

References

i Labor productivity calculated as revenue per full-time equivalent or FTE.

ii Accenture Research analysis of data from market reports, Oxford Economics. Note: Chemical market based on Oxford Economics chemical sales in real US$: 2023 US$4.4T, 2028 US$5.2T, difference US$800B

iii Accenture, "Where's the money in sustainability for chemical companies?"

iv Accenture Research analysis of data from market reports, Oxford Economics. Note: Chemical market based on Oxford Economics chemical sales in real US$: 2023 US$4.4T, 2028 US$5.2T, difference US$800B

v Accenture Research analysis of 79 companies publishing full 15-year data, Capital IQ, revenue as reported in local currency, excludes fertilizers

vi Accenture Research analysis of 79 companies publishing full 15-year data, Capital IQ, revenue and CAPEX as reported in local currency, excludes fertilizers

vii Accenture Research analysis of 257 companies publishing full 15-year data, Capital IQ, revenue as reported in local currency

viii Ibid.

ix Accenture Research analysis based on chemical company reports and news releases

x American Society for Engineering Education (ASEE) – US; All India Survey on Higher Education (AISHE)-Department of Higher Education – India

xi Bloomberg, "Top-Ranked MBA Programs Struggle to Reverse Declining Applications" Nov. 6, 2023

xii Accenture Research analysis of 79 companies publishing full 15-year data, Capital IQ, revenue and CAPEX as reported in local currency, excludes fertilizers

xiii Accenture analysis

xiv Accenture, "Work, workforce, workers: Reinvented in the age of generative AI", chemicals cut

xv Ibid.

xvi Ibid.

xvii Ibid.

xviii Accenture, "Reinvention in the age of generative AI"

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