



# Avoiding the Quiet Crisis in Industrial Technology & Engineering Leadership

In this publication, references to “**technology and engineering leaders**” or “**CTOs**” refer specifically to those leading core analog industrial and physical technologies, not digital or software-based roles.

There’s a lot of momentum in the U.S. industrial sector right now. Between reshoring, data center buildouts, infrastructure spending, and the energy transition, it finally feels like the sector is getting some attention. However, beneath the momentum lies a quiet crisis: the erosion of deep technology & engineering leadership. This is due to:



## The strategic value of technology and engineering leadership

The success of industrial companies depends on the design, reliability, and integration of physical products, assets, and systems. Not only are these leaders responsible for these fundamentals, their expertise remains a critical source of differentiation and innovation.

Despite its importance, we are seeing that the bench of experienced leaders is not expanding at the pace the industry requires. In many cases, it’s contracting. The forces behind this challenge are structural, not cyclical, and they are reshaping the sector’s ability to build, retain, and transition technical expertise.

# What's eroding industrial's technical leadership pipeline?

The pressures facing technology & engineering leadership are not the result of a single trend, but several long-building forces that are now converging across the industrial landscape.

## 01 The path to technical leadership is steep

Reaching the top of a technology & engineering career path in the industrial sector is a long, cumulative journey. When we examined 20 of the largest U.S.- based public industrial manufacturing companies that have named CTO on their ELTs, we noticed a common pattern: many CTOs hold advanced graduate degrees, including 5 MBAs, 10 Masters of Science and 8 PhDs. This reflects the depth of specialization required to lead in environments defined by complex products and high-stakes operations. We also found that most CTOs take on their first enterprise CTO role in their early 50s, supported by nearly 30 years of professional work experience. This level of readiness cannot be fast-tracked; instead, it's shaped through repeated exposure to engineering decisions and the hands-on realities of building and scaling physical systems over time.

Additionally, much of this expertise seems to develop through long term immersion in a single company. Many of the leaders we reviewed had spent well over five, even twenty, years at the same company. That kind of tenure is required to build technical credibility, trust, and deep institutional knowledge.

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## 02 Academy companies still offer the best training — but the model is under pressure

Many of today's top technology & engineering leaders can trace their early development to a small number of well-established companies such as GE, Honeywell and Boeing. These firms have long been admired for their engineering rigor, structured development paths, and ability to grow strong technical talent. And while they aren't the only sources of leadership, they've consistently played an outsized role in shaping the industry's senior technical bench.

However, this dynamic has created a leadership ecosystem that depends heavily on a relatively small pool of sources. When we examined the top 20 enterprise CTOs in this space, 18 were first timers, suggesting that the available talent pool is limited and organizations are increasingly willing to appoint first-time CTOs in order to meet leadership demand.

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## 03 Industrial companies are losing talent to adjacent sectors

On top of everything else, the pipeline isn't just narrow—it's leaking. We're seeing mid-level engineering and technical leaders move into adjacent sectors like energy transition, mobility, and tech. And it's not hard to see why. The path to leadership in these spaces is often shorter, less demanding, and the pace of innovation can feel more dynamic. We're also seeing a rise in non-compete agreements, as companies move to protect core IP and proprietary knowledge. As a result, when leaders leave, they're often leaving their primary industry — making their expertise even harder to recover.

This shift represents a meaningful challenge for industrial companies. As mid-career technical talent explores alternative pathways, companies risk losing high-potential leaders before they are fully developed internally.

# Securing the future of industrial technology & engineering leadership

The pipeline for technical & engineering leadership may be under pressure, but the challenge is manageable. Addressing this challenge requires a multifaceted approach:

## 01 Strengthen the technical bench

Building future-ready leadership from within takes more than identifying a few high performers. Companies must rethink how they grow and expose engineering talent across the organization. Key actions include:

### **Investing in early-career technical talent**

Create clear entry points through Centers of Excellence, rotational programs, or leadership development tracks that identify and support high-potential engineers early.

### **Formalizing parallel advancement paths**

Not all future leaders follow the traditional people management track. Elevate roles like technical fellows, distinguished engineers, and chief architects to retain and reward deep technical expertise.

### **Rotating mid-career engineers across critical functions**

Structure experiences that expose engineers to R&D, product development, and business-facing roles so they gain the cross-functional perspective needed to lead at scale.

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## 02 Invest in development program for senior leadership roles

As mentioned above, non-compete agreements are becoming more common to protect institutional knowledge. This added layer of restriction, combined with an already shrinking pool of senior technical talent, makes external hiring increasingly difficult. To reduce dependence on a limited external market, we are seeing companies prioritize internal development through targeted coaching, leadership development, and succession planning tailored to high-potential technical talent.

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## 03 De-risk external technical leadership appointments

Sometimes, hiring from the outside is unavoidable. But placing a senior technical leader into a complex industrial organization, especially one with deep legacy systems and a strong internal culture, comes with risks. Leading organizations are mitigating this by creating transitional or adjacent roles such as deputy CTO, chief architect, or enterprise technology lead that allow external hires to build credibility, absorb organizational context, and establish internal relationships before assuming the full leadership mandate.

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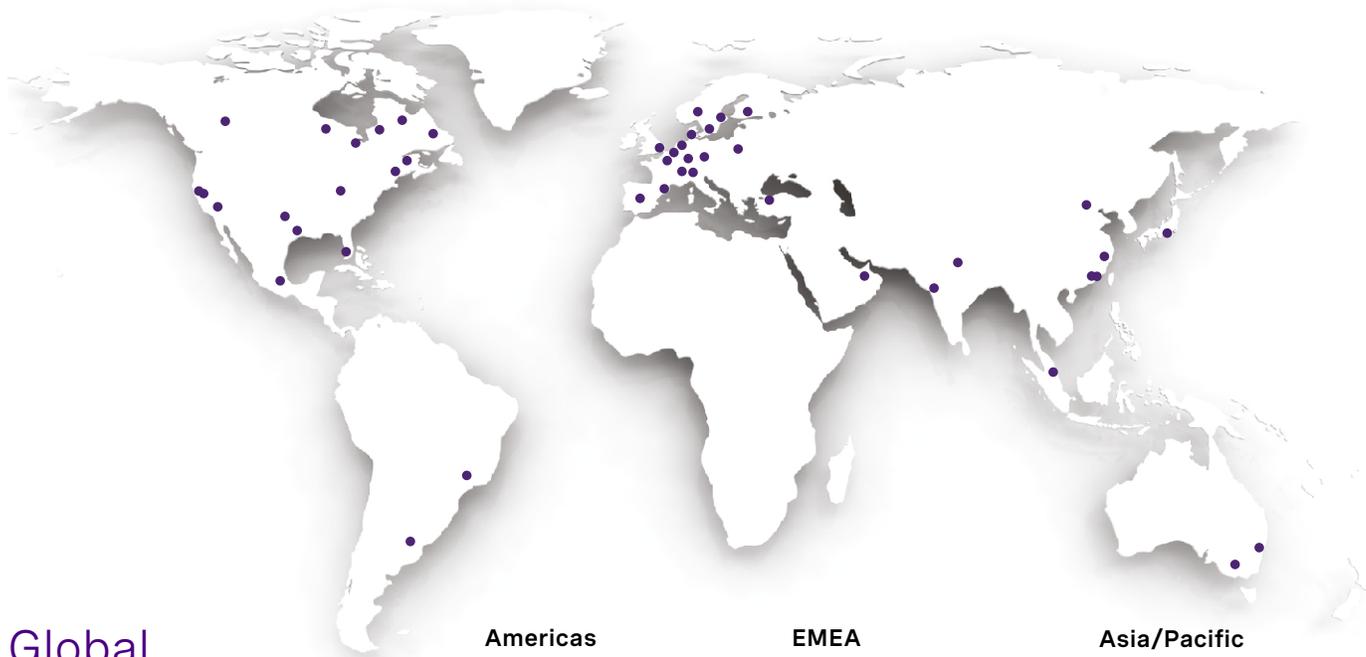
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Russell Reynolds Associates is a global leadership advisory firm. Our 500+ consultants in 47 offices work with public, private, and nonprofit organizations across all industries and regions. We help our clients build teams of transformational leaders who can meet today's challenges and anticipate the digital, economic, sustainability, and political trends that are reshaping the global business environment. From helping boards with their structure, culture, and effectiveness to identifying, assessing and defining the best leadership for organizations, our teams bring their decades of expertise to help clients address their most complex leadership issues. We exist to improve the way the world is led

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