FROST & SULLIVAN

TRANSFORMATIONAL GROWTH LEADERSHIP

A CEO Perspective

From Automation to a Unified Technology Stack: How COPA-DATA Is Enabling More Flexible Pharmaceutical Manufacturing





Stefan Reuther

Executive Board Member, COPA-DATA

in conversation with

Unmesh Lal

Vice President, Frost & Sullivan



Pharmaceutical manufacturing is becoming increasingly complex. Manufacturers are working with brownfield facilities, multiple automation technologies, long automation lifecycles, high validation and qualification requirements, and growing demands for data integrity, traceability, and cybersecurity. At the same time, they need greater flexibility to support changing products, production requirements, and manufacturing environments.

For COPA-DATA, this creates an opportunity that goes beyond automating individual processes. The company is positioning its zenon software platform as an open technology stack that can connect different areas of a pharmaceutical organization, from laboratory and R&D to process automation, production, utilities, environmental monitoring, filling and packaging, and Information Technology (IT)/Operational Technology (OT) integration. Its approach combines standardization and reusable components with the flexibility to adapt to existing plants and local requirements.

In this Transformational Growth Leadership discussion, Unmesh Lal, Vice President, Frost & Sullivan, speaks with Stefan Reuther, Executive Board Member, COPA-DATA, about the changing automation environment in pharmaceutical manufacturing, the bluefield approach to modernizing brownfield facilities, COPA-DATA's unified technology stack, open ecosystems and partnerships, modular manufacturing, AI-enabled engineering, customer implementation, and the principles shaping the company's future direction.

All rights reserved ©2026 Frost & Sullivan | www.frost.com

Managing Complexity Across Pharmaceutical Manufacturing

Unmesh Lal: *Stefan, you have been with COPA-DATA since 2002 and have seen the company grow from around 30 employees to more than 500. How has the automation environment changed during that time, particularly in pharmaceutical manufacturing?*

Stefan Reuther: The automation landscape has changed quite a lot in recent years and has completely changed since I started. The biggest challenge we see nowadays is no longer simply automating a process. It's basically managing complexity across the entire manufacturing network.

Pharmaceutical manufacturers are under increasing pressure to bring products to market faster, while also needing more flexible and modular production. They have brownfield environments with many different automation technologies, and there is still a high validation and qualification effort. They also have different automation systems across plants, disciplines, and regions, with long automation lifecycles combined with rapidly evolving IT technology.

At the same time, there are higher requirements for data integrity, traceability, cybersecurity, and everything combined with a shortage of automation and engineering resources. So the unmet need we see is **standardization without sacrificing flexibility**.

Pharmaceutical companies don't want every plant to become identical, because that's basically impossible. But they do want to standardize technology, architecture, engineering methods, and reusable components while retaining the flexibility to adapt the actual process to local or product-specific requirements.

Frost & Sullivan's **Transformational Growth Leadership Program** aims to honor visionary business leaders who possess the foresight and leadership acumen to drive positive change within their organizations. The leaders we celebrate hail from diverse sectors and company sizes, yet they all share an unwavering commitment to innovation and excellence.

> "The unmet need we see is standardization without sacrificing flexibility. Pharma companies don't want every plant to become identical, because that's basically impossible. But they want to standardize technology, architecture and engineering methods, as well as reusable components, while retaining the flexibility to adapt the actual process to local or product-specific requirements."
>
> —Stefan Reuther, Executive Board Member, COPA-DATA

All rights reserved ©2026 Frost & Sullivan | www.frost.com

Modernizing Brownfield Facilities Through a Bluefield Approach

Unmesh Lal: *That balance between standardization and flexibility seems particularly important when manufacturers are working with existing facilities. You have used the term* ***"bluefield"*** *to describe this approach. What does that mean in practice?*

Stefan Reuther: The term bluefield is described by Dr. Andreas Bamberg from Merck and his co-authors in their 2023 paper, "Modular Automation delivers what Industry 4.0 and IIoT promise." In practice, the idea is to prepare the production infrastructure and automation backbone in advance, so that qualified process modules can be integrated when needed, without having to engineer and wire everything from scratch. The key is standardization at the interface level, while preserving flexibility in the process equipment and its functionality. This allows manufacturers to introduce new products faster and reduce engineering effort and costs, without compromising the ability to adapt their processes.

Greenfield plants are not always the starting point; often, manufacturers need to work with existing facilities. Bluefield is an approach to combining standardized infrastructure and modular automation with the flexibility to introduce new technologies and production processes quickly.

Building a Stronger Position in Life Sciences

Unmesh Lal: *Life sciences has become an important area for COPA-DATA. How has the business evolved in this sector, and where are you seeing the strongest opportunities?*

Stefan Reuther: I can't disclose actual or detailed figures, but what I can tell you is that the life sciences industry is a strategic growth area for COPA-DATA and one where we see significant potential for zenon.

In recent years, we have built a strong customer base among global pharmaceutical companies, including organizations like Roche, Merck, AstraZeneca, Boehringer Ingelheim, and Almirall in Spain. Life sciences represents about one-quarter of our revenue and is steadily growing. As an organization, we are growing by around 17% on average every year, and the share of revenue from life sciences is also becoming bigger every year.

Our customer base in life sciences excludes medical devices, which is not an area we are focusing on. Where we have a strong footprint is in applications where the medication being produced is high-priced or where there is a need for modularity and frequent changes across batches. If it is mass production, customers usually have a different system. But if they need modularity and are changing what they produce, that is where we are in the game. I can't disclose actual or detailed figures, but what I can tell you is that the life sciences industry is a strategic growth area for COPA-DATA and one where we see significant potential for zenon.



All rights reserved ©2026 Frost & Sullivan | www.frost.com

In recent years, we have built a strong customer base among global pharmaceutical companies, including organizations like Roche, Merck, AstraZeneca, Boehringer Ingelheim, and Almirall in Spain. Life sciences represents about one-quarter of our revenue and is steadily growing. As an organization, we are growing by around 17% on average every year, and the share of revenue from life sciences is also becoming bigger every year.

Our customer base in life sciences excludes medical devices, which is not an area we are focusing on. Where we have a strong footprint is in applications where the medication being produced is high-priced or where there is a need for modularity and frequent changes across batches. If it is mass production, customers usually have a different system. But if they need modularity and are changing what they produce, that is where we are in the game.

One Technology Stack Across the Pharmaceutical Enterprise

Unmesh Lal: ***You have talked about the complexity customers are dealing with. When they come to COPA-DATA, what are they really looking for beyond individual software features?***

Stefan Reuther: We could talk about features, but at the end of the day, this is not what our customers are looking for. With zenon, our value proposition is that we provide a single, open software technology stack that can be used across different areas of a pharmaceutical organization.

That can include the laboratory and R&D, process automation, including our OpenDCS, modular production (MTP), continuous production, utilities, environmental monitoring systems, building management, primary and secondary filling and packaging, and the convergence between IT and OT systems.

Usually, it starts with one area where a customer is looking into a certain problem. They may have a need for a new environmental monitoring system, for example, or want to do something in process automation. During the evaluation, they then find out that we can provide that entire technology stack for the organization.

An Open Ecosystem Rather Than a Closed Technology Environment

Unmesh Lal: ***Vendor independence seems to be an important part of that proposition. How has your approach to partnerships and connectivity shaped COPA-DATA's position?***

Stefan Reuther: This is a very important part of our history. We started as an HMI/SCADA provider, but we never built our own hardware. That meant we had to connect to whatever hardware and systems our customers were using. Over time, we developed a broad portfolio of communication drivers, which made us increasingly independent of individual vendors and gave customers the freedom to choose their preferred hardware and technologies. Building on that foundation, we gradually evolved into a unified technology stack that goes far beyond the traditional HMI/SCADA, covering engineering, runtime, connectivity and communication, and enabling customers to address multiple automation disciplines on one platform.

In pharmaceutical manufacturing, end users essentially have two choices. They can select one of the big vendors with a closed ecosystem, or they can go for an open ecosystem.

One example is our collaboration with Cytiva. It demonstrates that COPA-DATA is not only working with major life sciences end users, but also with major technology providers. Cytiva and COPA-DATA are collaborating

All rights reserved ©2026 Frost & Sullivan | www.frost.com

to bring MTP technology into Cytiva's UNICORN control platform, helping to make the integration of Cytiva's ÄKTA systems with overarching site automation platforms such as zenon Process Orchestration Layer more standardized and efficient. I think the collaboration demonstrates something broader about our strategy: COPA-DATA is not only working closely with pharmaceutical end users; we are also working very closely with process equipment providers. We are building and leading an ecosystem around open standards and interoperability.

One Platform, Multiple Manufacturing Applications

Unmesh Lal: ***You mentioned that customers may initially come to you for one particular problem and then discover the broader platform. How does that expansion work across a pharmaceutical facility?***

Stefan Reuther: We have one unified software platform that serves all disciplines across a pharmaceutical enterprise. It can cover everything from utilities, building management, environmental monitoring and energy management to laboratory and R&D, process automation, continuous production, filling and packaging, and IT/OT integration.

The advantage is not just that you can build applications for all these areas on one platform. Because they share the same technology stack, customers can reuse what they have developed, integrate different disciplines more easily and make information available across the facility.

Competitors often use two or three different products to cover these areas. We offer one technology stack, from engineering and runtime to connectivity and communication drivers, combined with our approach to software-defined automation and industrial DevOps.

Starting Small and Expanding Across the Plant

Unmesh Lal: ***At the same time, most pharmaceutical companies are not going to replace everything they already have overnight. How does COPA-DATA approach that reality?***

Stefan Reuther: Our vision is "one platform, many solutions," but in practice, it often starts with one specific area. Customers usually don't want to replace everything at once, especially when they already have systems in place that work well. So, one solution often becomes our entry point into the organization.

What we are showing is that the same technology stack can serve all these areas. A customer might use us for process automation and modular equipment, while another already uses our software in filling and packaging through leading



All rights reserved ©2026 Frost & Sullivan | www.frost.com

pharmaceutical machine builders. From there, we can expand into GMP operations, replacing paper-based processes, or into plant infrastructure such as water, wastewater, utilities, environmental monitoring and building management. We can even extend beyond the plant into energy applications, such as substation automation, batteries and renewable energy systems. While competitors often need two or three different products to cover these areas, we offer one technology stack—from engineering and runtime to connectivity and communication drivers—combined with our approach to software-defined automation and industrial DevOps.

Creating a Common Data Layer for the Plant

Unmesh Lal: ***You also mentioned the automation integration layer. Where does that fit into the overall architecture?***

Stefan Reuther: When we enter a new customer, plant infrastructure and process automation usually already exist in some form. What is often missing is a common, solid data layer that brings together information from across the plant and makes it available to the customer's IT systems.

That's where our Automation Integration Layer comes in. It connects information from different areas of the plant and makes it available across the broader technology environment, allowing customers to make better use of the data they already have.

Connecting Modularity with Energy and Resource Efficiency

Unmesh Lal: ***You also connected modular production with energy efficiency and resource efficiency. Where does automation make a difference in that equation?***

Stefan Reuther: I can highlight one example, particularly around ESG and energy savings. Merck has publicly reported potential energy savings of around 30% from the modular approach, and they have also quantified approximately 15% savings in cost of goods sold.

An important point is that these benefits do not come from automation alone. Using modular equipment and modular automation makes it economically viable to use processing technologies optimized for a specific product much better.

Using the right equipment and modular equipment equipped with the right technology can result in higher yields and better resource efficiency. It also enables a scale-out rather than scale-up approach, allowing capacity to be added progressively as demand develops.

Innovation Through an Open Partner Ecosystem

Unmesh Lal: ***As your technology stack expands, how much do you want to develop in-house, and where do partnerships become important?***

Stefan Reuther: In an open ecosystem, partnerships are essential. We have a clear scope for our own products, but customers may need solutions that we don't intend to provide ourselves. Our approach is to focus on our strengths and work with partners to cover the broader ecosystem.

For example, we have a partnership with Körber, one of the leading MES providers in pharma, and are certified to connect zenon with their system. Tulip is another platform gaining traction in pharma, and we have established a relationship with them as well.

Partnerships are also important on the hardware side. Our offering includes

All rights reserved ©2026 Frost & Sullivan | www.frost.com

control logic, and our virtualized PLC can run on different controller platforms. To bring this to customers, we work with hardware vendors—for example, Beckhoff—to combine their controllers with our software.

Why COPA-DATA Is Choosing Organic Growth

Unmesh Lal: ***What about mergers and acquisitions? Is that part of the growth strategy going forward?***

Stefan Reuther: Not at the moment. We evaluate opportunities from time to time, but so far, our focus has been on investing in our own people and hiring to support the company's growth.

We do get interest from companies that would like to acquire us, but we have absolutely no interest in selling the company. Our large end customers sometimes ask what would happen if we were acquired and whether we would continue to operate in the same way.

To address this concern, our founder, Thomas Punzenberger, transferred all his shares into a foundation. This provides a long-term ownership structure that makes selling the company extremely difficult and ensures that, even when our founder is no longer involved, the company remains within the foundation rather than being divided among family members.

Measuring the Value of Modernization

Unmesh Lal: ***When you are helping customers modernize brownfield facilities, how do you demonstrate the return on investment? What are the measurable outcomes that matter most?***

Stefan Reuther: It's frankly a very difficult question to answer because it depends very much on the application they are looking into. But I can share one specific example that shows the potential.

At the Johnson & Johnson site in Latina, Italy, COPA-DATA was the automation and control supplier for the 2025 ISPE Facility of the Year Award winner for operational excellence. The project involved a highly flexible robotic line. Before the project, it took about six hours to complete the changeover. With the new technology, that dropped from six hours to 45 minutes.

We haven't calculated the ROI, but I can imagine that you will reach the break-even point quite quickly.

Building an AI-Ready Automation Environment

Unmesh Lal: ***AI is now part of almost every technology conversation. Where are you seeing the real opportunity for AI at COPA-DATA and within your customer environments?***

Stefan Reuther: Internally, we are looking at where AI can really benefit us, but we haven't fired any developers because of AI. For products like zenon, we still trust human expertise more than AI.

What we see very often is that customers want AI, but they are also lacking a solid data foundation with contextualized data. This is one of the areas we address through the automation integration layer. It extracts information from the field, contextualizes it, and provides it in a way that can be consumed by AI.

Another area is AI-supported engineering. We believe that, in the future, engineers will increasingly describe what they want

All rights reserved ©2026 Frost & Sullivan | www.frost.com

to build rather than manually create every automation project. This requires a capable API that can generate the application while keeping the human in the loop. We make a clear distinction between engineering and runtime. AI can support the engineering process, while the runtime is built from existing, reusable templates and objects. This is particularly important in regulated industries such as pharma, because validating ready-made, reusable objects is a more robust approach than having to validate newly generated code directly.

Turning the First Implementation into a Reusable Asset

Unmesh Lal: *Let's talk about what happens once a customer decides to work with COPA-DATA. How do you support them from the first implementation through validation and eventually replication across sites?*

Stefan Reuther: Compared with the past, we have taken a much more active role in the adoption phase of the customer. We have our own teams working closely with customers to define standards, establish target architectures, and develop corporate automation standards.

We are usually closely involved in building the first pilot, starting with one production area, an application, or a plant. At this stage, we work together with the customer to develop reusable templates and components that can then be integrated into the customer's validation framework.

Once these are established, we take a step back from implementation. We have a partner community of several hundred system integrators who handle replication across sites and plants. Our role is to remain the technical authority, providing guidance, improving the templates and supporting the customer and our partners. The key difference is that the first implementation creates reusable assets. Instead of every system integrator building everything independently, they can use the templates and objects developed together with the customer, making replication more consistent and efficient.

Bringing Cross-industry Experience into Pharma

Unmesh Lal: *COPA-DATA isn't focused exclusively on life sciences. How does that broader industry exposure influence what you bring to pharmaceutical customers?*

Stefan Reuther: If you want to work with the pharmaceutical industry, you need to speak its language. You need to understand the domain and the technology.

We are not exclusively focused on life sciences, and that also brings benefits. It gives us greater stability as a company, because pharmaceutical investment is not always consistent. At the same time, we can learn from technological developments in other industries and bring those insights into pharma.

For example, the energy industry is driving the adoption of Linux and Linux virtualization, trends that are also relevant to pharma. We are already delivering projects that run entirely on Linux and are fully web-based. We can bring these technologies into pharmaceutical environments, even if the demand for them is currently stronger in other industries. So, while we are not exclusively focused on pharma, we understand the industry and can apply experience from across sectors.

All rights reserved ©2026 Frost & Sullivan | www.frost.com

Open, Standardized, and Evolvable

Unmesh Lal: *Stefan, let's close with the future. If you had to describe COPA-DATA in three words and explain what those words mean for the company's direction, what would they be?*

Stefan Reuther: I would position us as **open, standardized, and evolvable**.

First, open, because we believe pharmaceutical companies need to integrate equipment, automation systems, MES, data platforms, and enterprise systems without being locked into a single technology ecosystem.

Standardized because the industry needs to move from individual plant solutions toward common automation architectures, with reusable templates and consistent technology across sites and disciplines.

And evolvable, perhaps the most important one, because pharmaceutical manufacturing is changing faster than ever. Automation must support modular production, new equipment and processes, as well as existing plants and new technologies, without requiring a completely new automation approach every time.



Closing Reflection

Pharmaceutical manufacturing is moving toward greater flexibility, modularity, and connectivity, but much of the installed environment remains complex and highly heterogeneous. COPA-DATA's approach, as described by Stefan Reuther, is to address that complexity through an open technology stack that can connect different areas of the pharmaceutical enterprise while allowing manufacturers to retain existing infrastructure and adapt to changing requirements.

The company's bluefield approach reflects that philosophy: standardize the technology, architecture, engineering methods, and reusable components without forcing every plant to become identical. The same principle extends to its partner ecosystem, where COPA-DATA works with equipment providers, MES companies, hardware vendors, and system integrators rather than attempting to provide every layer itself.

AI adds another dimension to this evolution. For COPA-DATA, the opportunity is not simply to add AI to automation, but to establish the contextualized data foundation required to make AI useful and to make engineering more AI-capable while maintaining a human role and supporting validation requirements.

Ultimately, Stefan's three words, **open, standardized, and evolvable**, capture the direction of COPA-DATA's approach. The objective is to give pharmaceutical manufacturers a technology environment that can integrate what they already have, support what they need today, and evolve as manufacturing requirements change.

All rights reserved ©2026 Frost & Sullivan | www.frost.com



Stefan Reuther | Executive Board Member, COPA-DATA

Stefan Reuther is an Executive Board Member at COPA-DATA, where he is responsible for customer-related activities. He joined the company in 2002, initially working as a support engineer before moving into sales, area management, and key account management. Since 2017, he has been a member of the company's executive board. His perspective in this discussion focuses on pharmaceutical manufacturing automation, open technology ecosystems, modular production, AI-enabled engineering, customer implementation, and COPA-DATA's approach to long-term growth.



Unmesh Lal | Vice President, Frost & Sullivan

Unmesh Lal brings over 20 years of experience in healthcare strategy and consulting, with a focus on global life sciences and precision health. He specializes in identifying transformative technologies, innovative business models, and growth opportunities across pharmaceutical manufacturing solutions & services. A recognized thought leader, Unmesh has authored key industry insights and presented at leading global events including J.P. Morgan, Bioprocessing Summit, CPHI, Bio-IT World, Medica Health IT, etc. He holds a master's degree in biomedical engineering from the University of Michigan–Ann Arbor.

Ready to Lead the Transformation?

- **Schedule a Growth Strategy Dialog:** Align your growth roadmap with Frost & Sullivan's Visionary Growth Pipeline™ Dialog.
- **Engage with Growth Experts:** Co-design AI-enabled, data-driven operating models that scale industry-specific and commercial impact.
- **Showcase Your Transformational Leadership:** Position your organization as a transformation leader through Frost & Sullivan's Transformational Growth Leadership platform.
- **Join the Growth Council:** Collaborate with industry leaders shaping the future of your ecosystem.
- **Explore Best Practices Recognition:** Be recognized for excellence in growth strategy, execution, and customer impact.
- **Benchmark Your Industry Positioning on the Frost Radar™:** Benchmark your growth performance and innovation strength against industry competitors.
- **Tell Your Story:** Accelerate awareness, engagement, and revenue growth through integrated brand and demand generation strategies.

All rights reserved ©2026 Frost & Sullivan | www.frost.com

Appendix: Shaping the Future of Commercial Vehicles

As pharmaceutical manufacturers manage increasingly complex automation environments, brownfield facilities, modular production requirements, validation needs, and growing demands for connected data, the ability to modernize without sacrificing flexibility is becoming increasingly important. The convergence of open automation, software-defined systems, IT/OT integration, and AI-enabled engineering is creating new opportunities to build more adaptable and connected manufacturing environments. Frost & Sullivan provides strategic intelligence across these developments, including::

- Growth Opportunities in Global Pharmaceutical Industry, 2026
- Frost Radar™: Life Sciences Laboratory Information Management Systems, 2026
- Frost Radar™: SCADA for Industrial Control Environments, 2026

These analyses complement the themes explored throughout this discussion, including the evolution of industrial automation, open and software-defined automation environments, connected pharmaceutical manufacturing, digital laboratory workflows, IT/OT integration, and the growing role of AI-enabled technologies in supporting more flexible and data-driven operations.

YOUR TRANSFORMATIONAL GROWTH JOURNEY STARTS HERE

Frost & Sullivan's Growth Pipeline Engine, transformational strategies and best-practice models drive the generation, evaluation, and implementation of powerful growth opportunities.

Is your company prepared to survive and thrive through the coming transformation?

Join the journey. →

FROST & SULLIVAN