

The New Standard in Life Sciences Manufacturing

**AI, THE NEXT ACCELERATOR TO BRING
EFFICIENCY AND RESILIENCE
TO LIFE SCIENCES MANUFACTURING
AND SUPPLY CHAINS**

WHITEPAPER



SmartBrief

CONFRONTING THE CURRENT CHALLENGES IN LIFE SCIENCES MANUFACTURING

The pharmaceutical and MedTech industries have invested significant time and resources in systems to modernize manufacturing and supply chain operations.

However, the COVID-19 pandemic put these operations to the test and highlighted the importance of three priorities:

- **The creation of global and local supply chain networks.**
- **The need for more autonomous operations.**
- **The benefits of the cloud and artificial intelligence to quickly digitize the value chain.**

On the MedTech side, manufacturers needed to react quickly to both increased health and safety mandates as well as unpredictable demand. For example, millions of elective procedures were deferred during the pandemic.¹ Meanwhile, there was a surge in demand for life-saving medical equipment, personal protective equipment, ventilators, diagnostics and other supplies.

Biopharma and vaccine manufacturers also found themselves dealing with storage and logistics complexities, as some COVID-19 vaccines required extreme cold storage, and more than 80% of active pharmaceutical ingredients imported to the US come from China or India, which were hard-hit by the pandemic.^{2,3}

Management of these new challenges was complicated by the fact that life sciences manufacturing plants have multiple localized operational and transactional systems, which are often integrated only with the enterprise resource planning systems and lack integration with operation technology systems. As specialized IT and operational technology resources are scarce, many manufacturers are struggling to achieve real-time transparency for their global operations.

Plants are able to make decisions at a local level, but they may not have a global view of the company's manufacturing and supply chain operations. This can limit opportunities to create business intelligence beyond a given business unit or regional boundaries.



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Further, there is often a multifactory visibility problem after acquisitions, which can limit the success of company growth efforts, says Simon Floyd, Director of Discrete Manufacturing Industries at Google Cloud. “If there’s an acquisition, it’s more than likely that the new facility is on a completely different facility or standard, so it’s invisible to all the other plants.”

But perhaps the greatest consequence of legacy and fragmented infrastructure is that it creates barriers to adopting new AI-based technologies.

This is especially relevant now, as the new and ongoing challenges exacerbated by the pandemic highlight the need for greater resilience and for a smarter, more efficient way to manage manufacturing and supply chain operations. The answer is Industry 4.0, or “the fourth industrial revolution.”

Industry 4.0 builds on the use of computers and automation and leverages smart solutions backed by machine learning.⁴ Already, about 60% of manufacturers that use AI in their daily operations are increasing their reliance on the technology.⁵ The ultimate goal is for connected computers to make decisions with minimal human involvement, such as automatic supply chain adjustments for weather and autonomous equipment working in factories.⁴

McKinsey’s and the World Economic Forum have estimated that manufacturers implementing “Industry 4.0” could see \$3.7 trillion in additional value in 2025.⁵

Google Cloud is investing in these technologies for the life sciences space, and it can provide various opportunities for digitization of both manufacturing and supply chains to address the above challenges and tap into the expected gains.

A SMARTER FACTORY (FACTORY 4.0)

Pharmaceutical and MedTech companies need a smart factory solution, backed by AI and machine learning, that connects remote equipment, uses data and analytics to make manufacturing more efficient and provides global visibility into all core key performance indicators.

Currently, AI is being leveraged in five main areas of manufacturing:

- quality inspection (39%).
- supply chain management (36%).
- risk management (36%).
- production line quality checks (35%).
- inventory management (34%).⁵

In the current environment, most pharmaceutical companies use a batch manufacturing process. By getting continuous data from the process and equipment layer and correlating between process parameters and quality attributes, companies can perform faster interventions for any batch failure points, says Suchitra Bose, Director of Manufacturing Industries at Google Cloud.

Factories can leverage AI to replace heavily manual processes and help reduce errors while freeing people to focus on higher-level tasks. Human interaction can be reduced at various steps by:

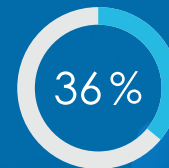
- Using voice commands to control certain operations.
- Digitizing processes with advanced analytics, simulations, augmented reality and virtual reality.
- Using digital software upgrades to replace manual upgrades.

In fact, manufacturers cite improvements in business continuity (38%) and greater employee efficiency (38%) among the top reasons they are implementing AI technologies.⁵

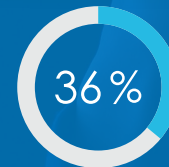
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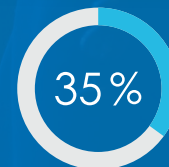
QUALITY INSPECTION



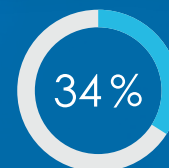
**SUPPLY CHAIN
MANAGEMENT**



RISK MANAGEMENT



**PRODUCTION LINE
QUALITY CHECKS**



INVENTORY MANAGEMENT⁵



Visual inspections of surgical kits

A **TECHNOLOGY** can verify that various conditions for a product or its labeling are met, helping companies streamline manual processes, such as visual inspections, while maintaining accuracy.

Google Cloud recently conducted a visual-inspection pilot with a MedTech company that ships surgical kits to hospitals. One kit can contain hundreds of instruments needed for a given surgery, and each kit is manually inspected for accuracy before shipping, upon receipt at the hospital and again post-surgery.

By leveraging Vision AI to help conduct the quality inspections during the pilot project, kit-processing time was reduced significantly while maintaining accuracy.⁶ In addition, the company was able to increase turns of the kits — which can cost thousands of dollars — significantly improving productivity of assets and enabling hospitals and surgeons to serve more patients. ■

“One thing that makes AI very compelling is its ability to scale and be very repeatable without a reliance on training people,” Simon Floyd, Director of Discrete Manufacturing Industries at Google Cloud, said.

A particular benefit of increased automation comes in the form of real-time, computer vision-based inspections of the factory floor and production line. These inspections can identify debris, misplaced objects, PPE conformance and compliance with company and OSHA protocols, as well as provide a source of information for internal audits and quality improvement initiatives.

Companies can be more proactive with planned maintenance as well. Digital twins of both machines and the factory allow teams to plan intelligently and minimize downtime. For example, the digital twin model might show that a machine can be cleaned after 10 cycles instead of eight without experiencing problems. AI/ML also provides predictions of future performance and possible problems, which can save millions of dollars in unplanned downtime.⁶ Processes can then be optimized, with recommended actions such as energy-reduction steps submitted to the building management system for verification before implementing.

A SMARTER SUPPLY CHAIN

Industry 4.0 brings many benefits for the supply chain as well, including real-time visibility into production, partners, suppliers and market events. This enables greater resilience to disruptions such as the COVID-19 pandemic, Suez Canal blockage, supplier financial trouble, environmental risks and geopolitical risks.

Pharmaceutical and MedTech companies can predict, capture and understand supply chain information, effects and possible solutions, such as moving inventory to areas that are expected to see higher demand or even pivoting to manufacture a different product in response to an expected change in the market.

They have full visibility into factory capacity, so they know if they are able to meet a rise in demand close to where that need is located, or if they should tap capacity at other factories. This type of adaptation was seen during the COVID-19 pandemic, with Merck offering capacity to manufacture Pfizer's vaccine, Bose notes.

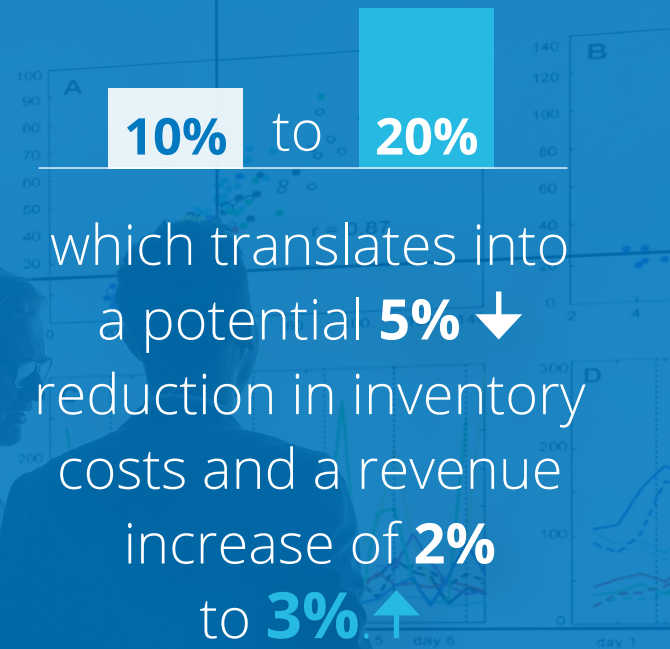
Google Cloud's technology offers a modernized way to address the many supply chain challenges in this industry, from demand forecasting to fleet routing optimization. Improved demand forecasting is based on underlying causal drivers of demand, vaccine distribution/vaccine acceptance, CDC data, seasonal illness data and expected weather, rather than relying solely on past sales as an indication of future demand. Analyzing these real-time drivers can improve forecasting by 10% to 20%, which translates into a potential 5% reduction in inventory costs and a revenue increase of 2% to 3%.⁷

To capitalize on these signals, Google Cloud offers proprietary AI/ML models, enrichment of demand signals and insights for planners.

Its logistics solution also allows companies to create a digital supply chain twin that models a real-world scenario. For example, they can plot the optimal routes and schedules for each vehicle using real-world traffic data from Google Maps and input origins, destinations, truck configurations and facility timing restrictions for pickup and delivery. They can then move fulfillment locations closer to end demand and determine if there are opportunities to trim the fleet in certain regions, reducing both costs and environmental impact. In one pilot program, Google Cloud helped a company reduce its fleet by 25%.

With the increasing potential of disruptions to the supply chain, it is critical that companies keep a pulse on these risks throughout their network. The ability to identify risks, whether geopolitical, financial or natural disasters, will enable supply chain managers to model scenarios and keep themselves ahead of the curve should disruptions come to fruition.

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DIGITIZATION OF THE ENTIRE BUSINESS

Digitizing the factory and supply chain is vital to driving business growth and efficiency. With key technological advancements, life sciences companies will gather more useful data and will make the connections for manufacturing and supply chain improvements that benefit their entire operation.

Google Cloud offers real-time data visibility and automation to increase speed, lower costs and turn business insights into better operations, so life sciences companies can save and change more lives.

For companies taking the next steps to achieve these goals, Google Cloud is the right partner to achieve the cutting edge of what is now possible. ■

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