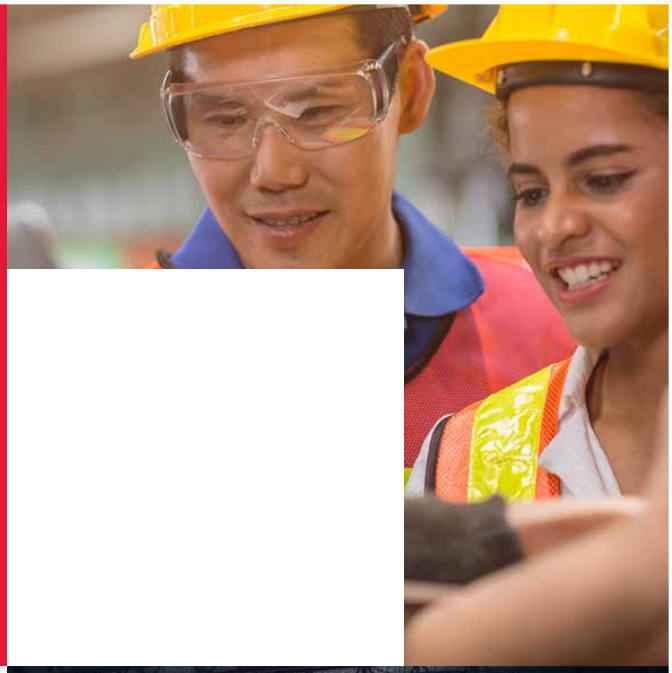

Unified Manufacturing

Digital Factory

Unifying people, processes, machines and technology

CGI

The transformative future of manufacturing

Manufacturing is at a turning point. The industry is poised to become increasingly automated with intelligent analytics at its core. Hyper-personalization will drive production lines and cognitive computing will hasten innovation. In addition, collaborative digital ecosystems will allow manufacturers to be far more responsive to customers, offering innovative services and sustainable products in a circular economy.

There is also a new impetus. With Industry 5.0 imminent, customers, investors, governments and regulators are asking manufacturers to go beyond using technology solely for profit to using its power to become responsible leaders of the future. This shift requires putting people and the environment back into the equation and ensuring that man and machine work together to support a digital, green future. A future that offers:

- Higher worker value, innovation and satisfaction
- Hyper-personalization and highly customizable offerings
- Sustainable manufacturing practices
- Collaborative digital ecosystems
- Agile, responsive and resilient production

At CGI, we believe a digital factory is core to realizing this future.

The adoption of Industry 4.0 technologies and the introduction of Industry 5.0 ambitions promise an exciting and transformative future for manufacturing.

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CGI's Manufacturing Atlas

Supporting your successful journey

Unified Manufacturing

Achieving an insights-led digital continuum

Unified Manufacturing is our vision for the future of the industry. It aims to unify manufacturers within their plants, across their value chain and with their wider ecosystem to become more adaptive and responsive to stakeholder demands. Through deep digital connection, integration of information technology (IT) and operational technology (OT), and the application of proven business methodologies, manufacturers can realize their strategic vision and achieve an insights-led digital continuum.

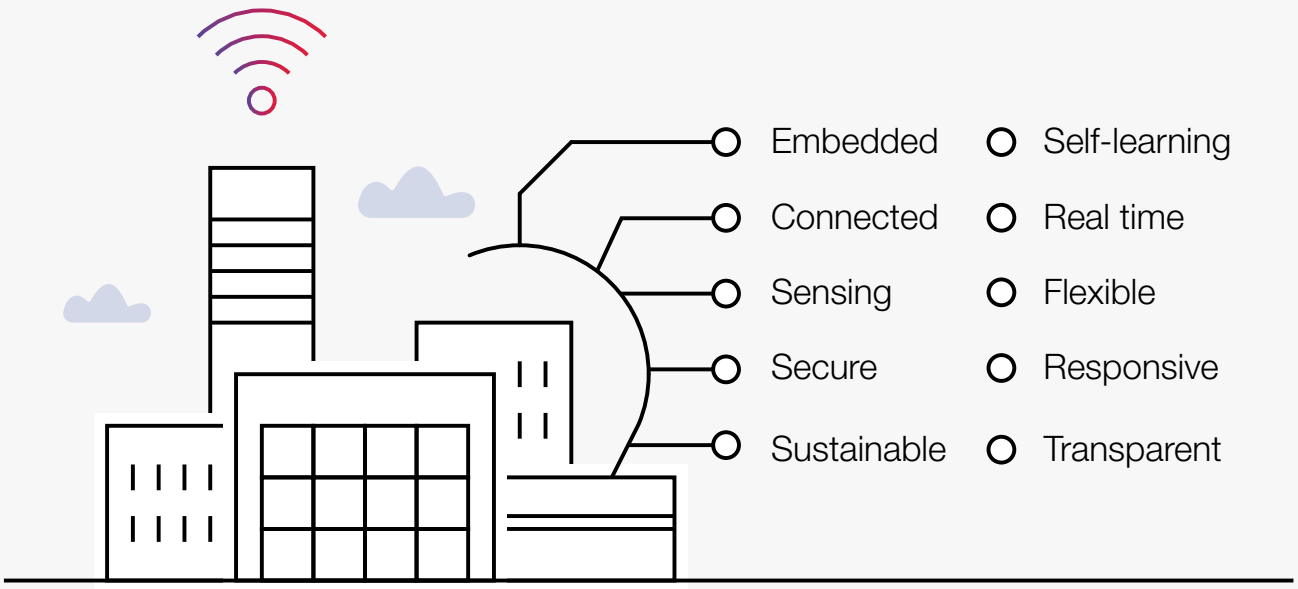
Definition of “unified”
adjective [yü-nə-ˌfīd]

To make or become united, uniform, or whole. Brought together, combined, or united. Involving several people, organizations, or countries that all work together.

What is a digital factory?

We envision a digital factory as an intelligent digitally connected plant that:

- Enables manufacturers to realize their strategic vision and business goals
- Interfaces with the worker and wider ecosystem
- Applies and integrates the latest in advanced technologies to optimize and enhance operations
- Strives for Industry 5.0



A digital factory unifies people, processes, machines and technologies.

Business objectives of a digital factory

Designed with business objectives top of mind, a digital factory delivers concrete outcomes and unlocks tangible benefits across the shop floor, enabling you to:

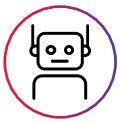
Build resilience
Improve business continuity by responding rapidly to disruptions across global supply chains and increase transparency through a real-time overview of the value chain.

Become more agile
Respond faster to changes in external circumstances to always perform in the best possible way with the required speed-to-market.

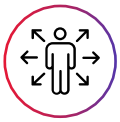
Increase efficiency
Fine-tune production, maintenance and supply chain performance with greater granularity to maximize cost effectiveness.

Decrease expenditure
Reduce costs through high automation, decreased levels of waste and optimized operations.

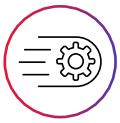
Embrace sustainability
Lead with sustainability objectives to reduce carbon footprint, build sustainable supply chains in a circular economy and support local communities and biodiversity.



Harmonize human-machine interaction
Leverage responsible artificial intelligence (AI) to support harmonious human-machine relations and ensure worker well-being.



Enable hyper-personalization
Become more client-centric by having a clear view of each unique customer's needs to offer more personalized products and services.



Increase speed
Optimize production lines through machine learning and data analytics and increase output without sacrificing quality.

Tangible benefits of a digital factory

1

Productivity
Do more with less by leveraging automation systems that can access real-time data wirelessly from anywhere.

2

Agility
Fewer cables help to reduce costs and make it easy to move equipment around to reconfigure a product line based on customer demands.

3

Safety
From automated guided vehicles (AGVs) with collision avoidance to the remote control of equipment in dangerous areas, better connectivity makes industrial environments safer.

4

Quality
Better connectivity enhances process monitoring and inspection and enables remote experts to help with complex assembly tasks in real time. In addition, machine learning and analytics improve production.

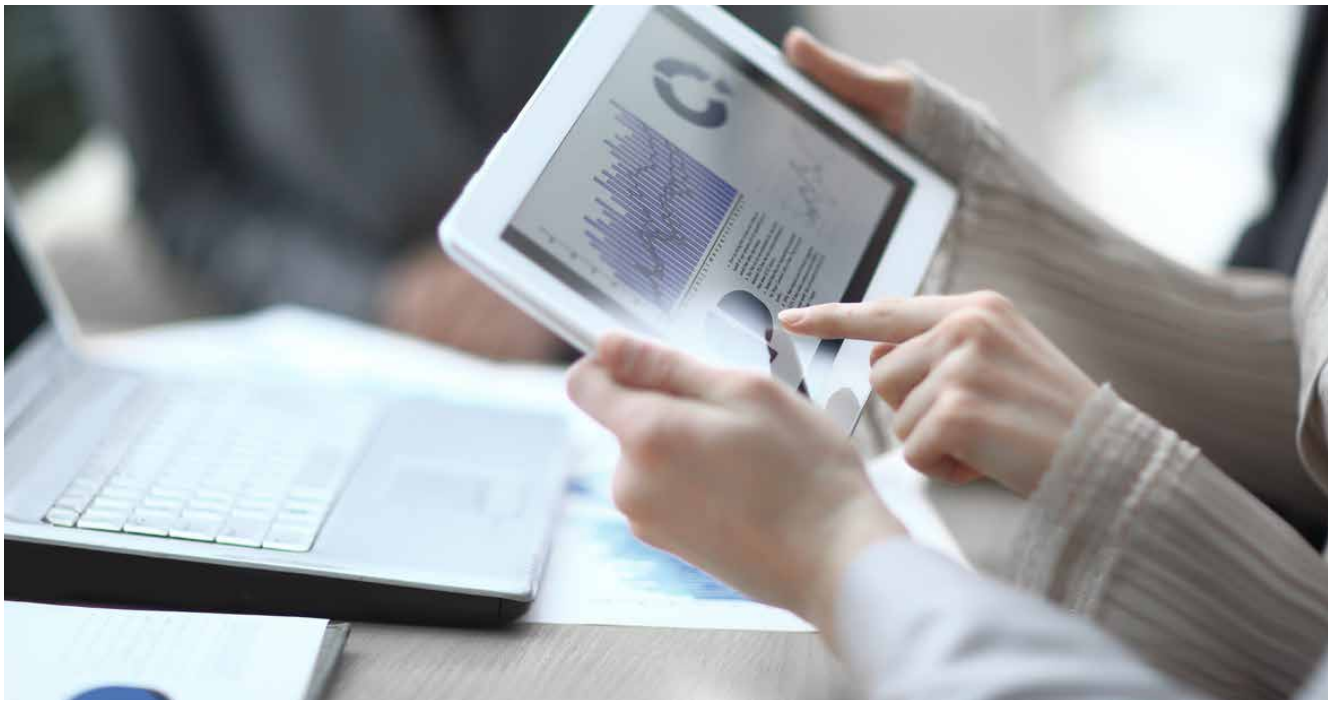
5

Track and trace
Assets, personnel and components can be tracked to reduce wastage, loss, theft and intrusion. Tracking also improves security in the workplace and the ability to locate misplaced tools, and ensures smooth logistics.

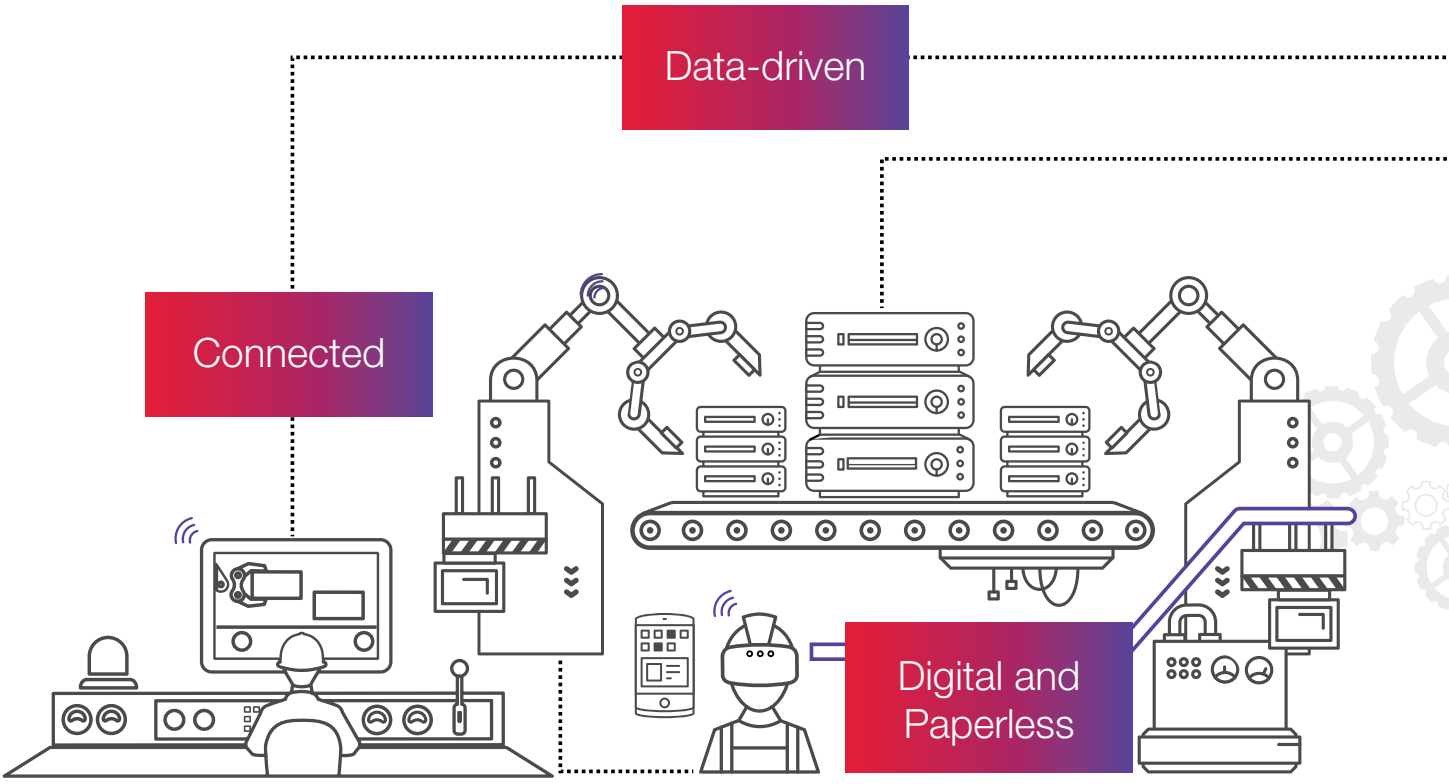
6

Maintenance
Systems devices can easily be managed due to their integration and serviceability. End users do not need to worry about frequent upgrades and maintenance as these tasks can be automated.

A digital factory offers numerous benefits. However, transforming the factory floor and operating in a holistic manner is not without its challenges. Many manufacturers seek clarity when it comes to next steps and support to transform the latest innovations and ”buzz” words into real-life practical actions. Moreover, organizational challenges such as a boardroom-shop floor disconnect, aging workforces and legacy systems continue to hinder progress. And while advancements in technology continue, the right assets or access to the right expertise is often missing. As a traditionally slower-to-transform industry, there also is hesitancy to embrace this new world.



Unified Manufacturing: 5 core building blocks



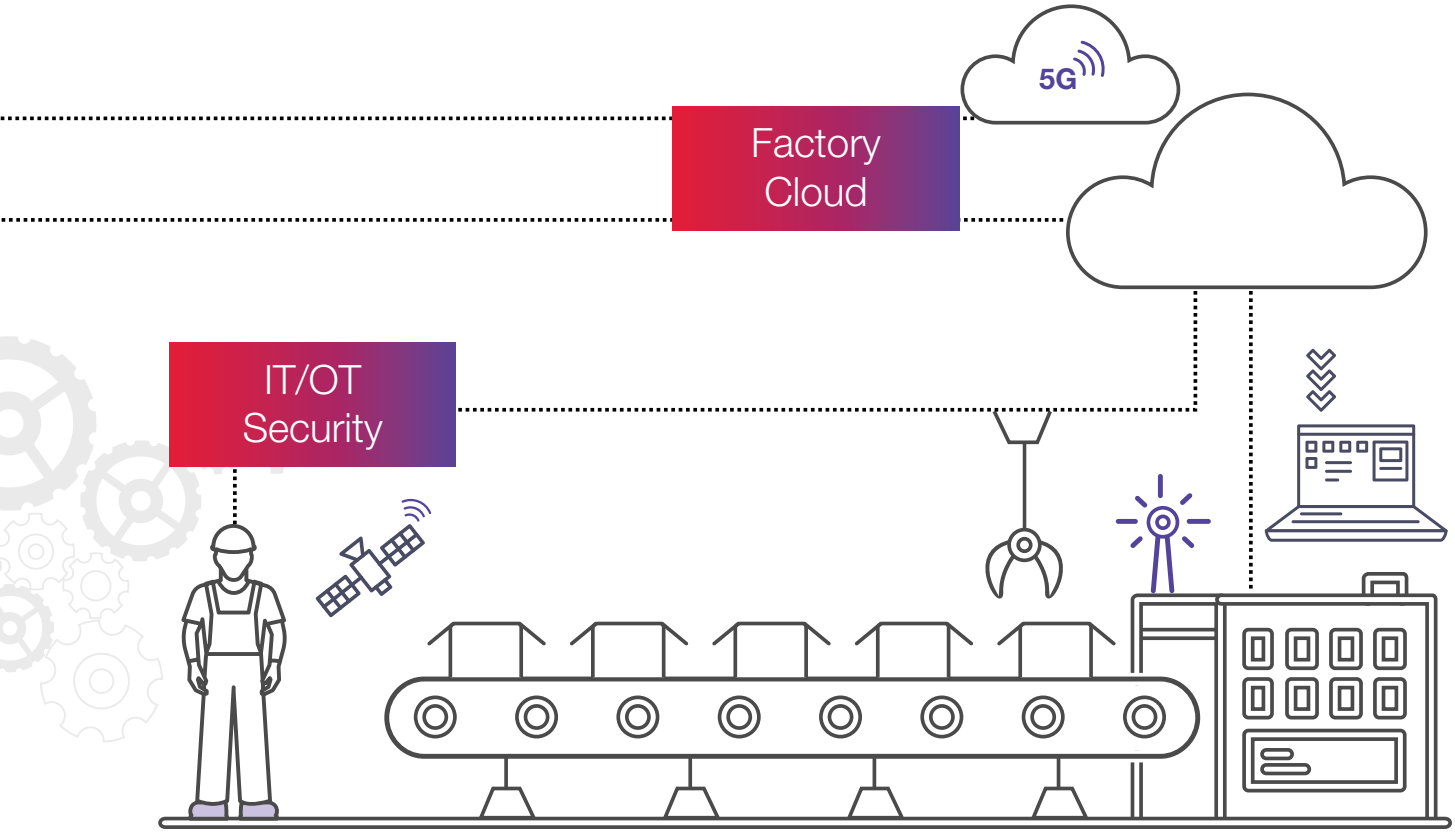
Cloud computing

Wireless networks

Internet of Things (IoT)

Advanced robotics

Drones



Mobile devices

Augmented reality (AR)

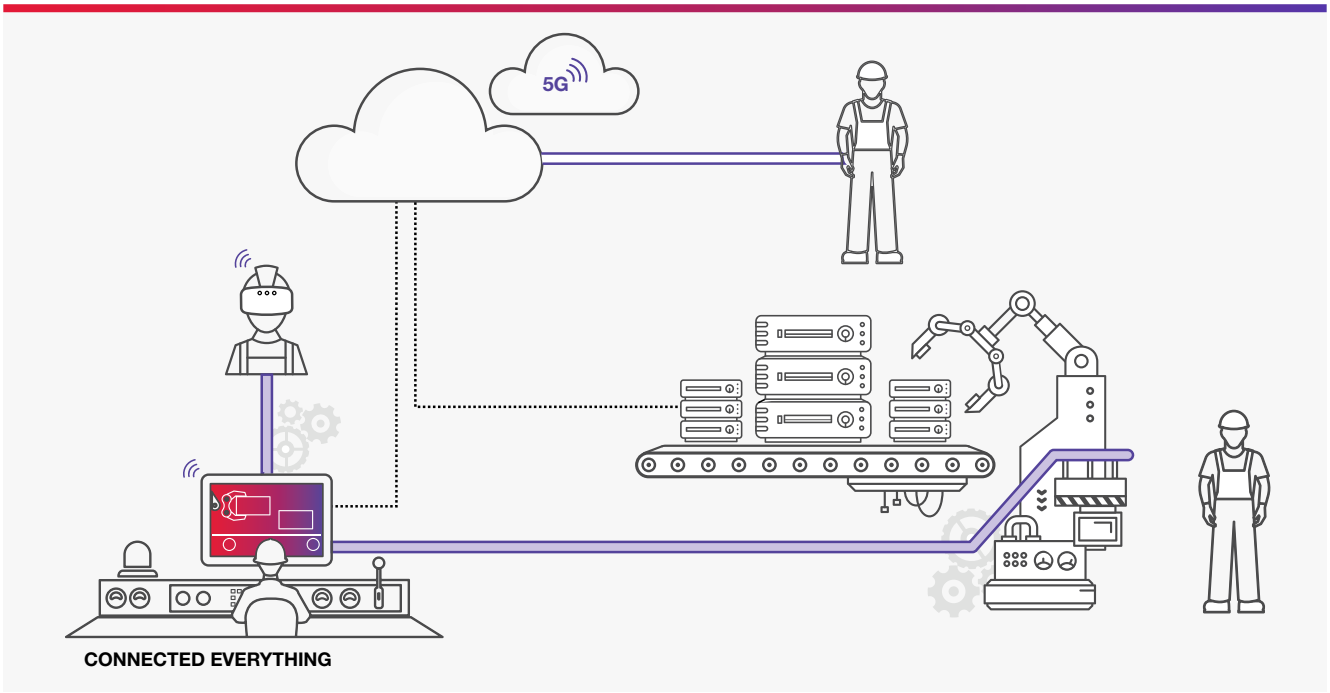
Big data analytics

Cybersecurity

AGVs

3D printing

1. Connected



Leveraging wireless sensor technology to connect machines, devices, systems and humans

The convergence of IT and OT is central to bringing the digital factory to life. By digitizing old assets using IoT, wireless sensor technology and communication networks, your factory can become fully connected, sensing and learning and sharing this knowledge with other machines and shop floor personnel in the plant.

Investing in ready-built, mobile and IoT-capable platforms enables you to:

- Accelerate time to market for next-level customer experiences;
- Monetize data from assets and products;
- Benefit from more efficient and automated processes; and
- Dramatically reduce maintenance and production costs.

IoT, IT and OT convergence, and advanced technology applications within the factory are only possible with a network that supports connection. Whether it requires a private 5G network or Bluetooth connectivity, we work with you to understand your unique landscape and suggest the best option. Our global partnerships and technical know-how will prepare your business for a secure, high-bandwidth, connected future while our manufacturing experts help unlock the benefits of a connected factory.

CASE STUDY

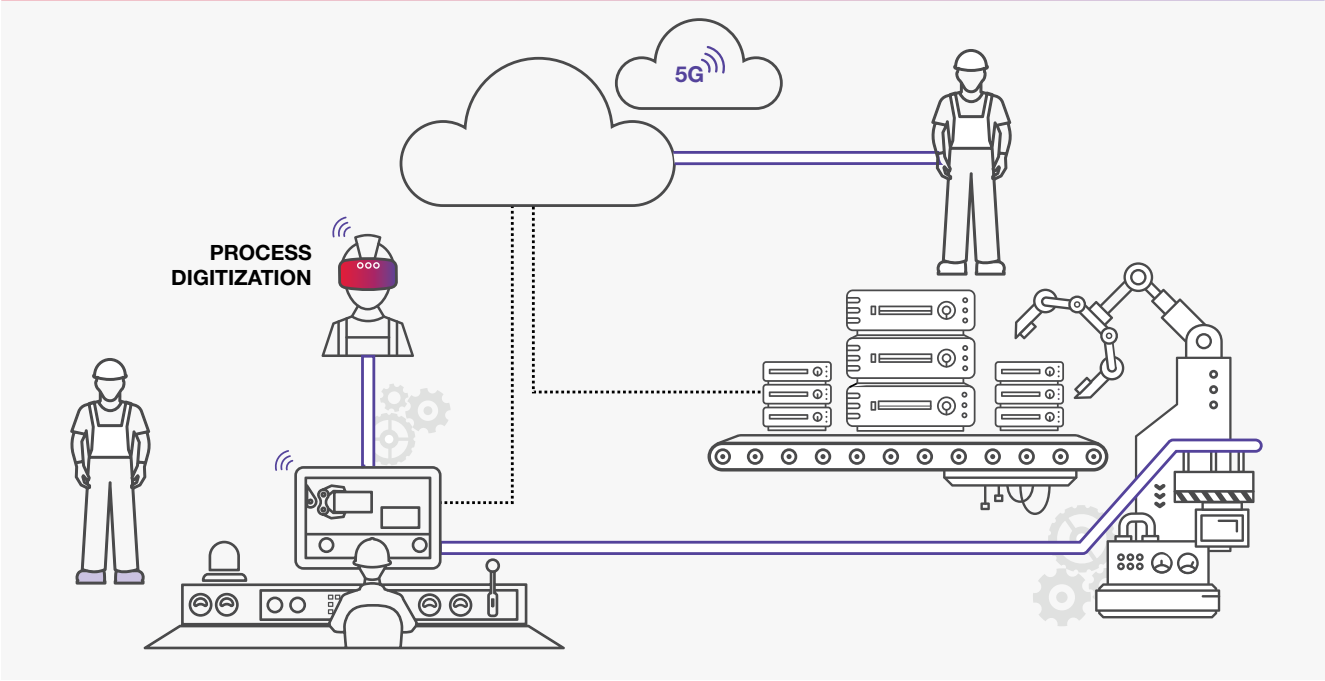
Let the machines talk

A leading Trimble construction technology provider is responsible for maintaining Camelot, a site that hosts over 26 chemical companies. With such a large portfolio and rising client expectations, the company wanted to explore how to best use technology to support predictive maintenance.

Combining our technical know-how and their extensive knowledge of the assets, we developed the Asset Health Center, a dedicated asset monitoring and analytics platform.

The platform gathers and analyzes data from over 400 assets to provide real-time insights into asset health and performance and predict maintenance requirements. Now, our client can detect potential issues in the foreseeable future. Productivity has increased, asset maintenance costs have come down and insight into asset energy consumption has improved.

2. Digital and paperless



Digitizing processes and integrating them with your MES and ERP system to increase efficiency, improve throughput and quality

Digitization offers the opportunity to do business in a profoundly different way—as a connected, adaptive and sustainable manufacturer, integrated with your entire ecosystem.

Whether it is eliminating paper completely or streamlining and automating traditionally people-intensive processes, manufacturing is evolving. By integrating MES and ERP systems, manufacturers today can benefit from harmonious and efficient operations. Advanced technologies can empower machines to “sense” and “respond” in real-time. Machines can exhibit autonomous behavior and provide real-time information to employees on the shop floor. For instance, AGVs for the safe movement of loads or augmented reality (AR) for workplace safety.

Our MES centers of excellence are dedicated to helping clients maximize the combined benefits of MES and Industry 4.0 to gather rich insight for operational excellence, continuous improvement and regulatory compliance. Our global delivery model enables us to offer a “best-shore” approach that gives you access to our 1300 MES experts who understand your local business and work with you to drive projects more accountably and responsively than any company of our kind.

CASE STUDY

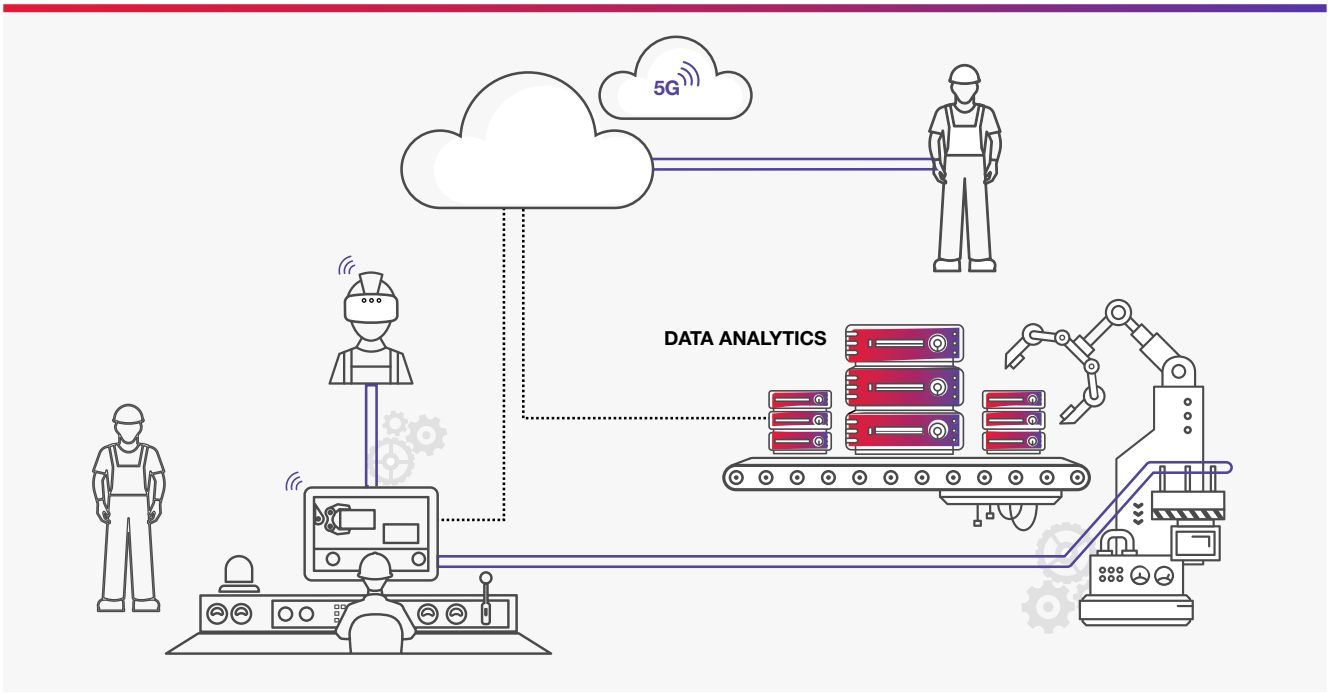
4D digital twin improves worker safety and maintenance efficiency

At metals and mining facilities, planned and unplanned work stoppages for maintenance can cost millions of dollars. In addition, keeping track of all maintenance work orders along with the location and safety of employees is a challenge.

Our client, a European high-tech mining and mineral group, wanted to improve their worker safety and business agility, and decrease overall maintenance time. As a long-standing partner who understood their business and strategic goals, we built a 4D digital twin of one of their plants, based on building information modeling (BIM) and data from maintenance work orders and systems. With an easy-to-navigate API to the maintenance management system, they can now view, in real time, a 4D model of operations as well as current maintenance projects. With this solution, our client is able to plan and effectively manage maintenance tasks leading to faster, more efficient repairs and a safer work environment.

Read more

3. Data-driven



Unlocking the value of data to enable monitoring, simulations and predictions for insight-led decision-making

Data is the cornerstone of a digital factory. It provides critical awareness of performance levels against KPIs and supports crucial innovation and optimization programs.

With the right data, manufacturers can make decisions based on fact rather than “best guess” decisions. Once the data is contextualized and given meaning, it can power automation programs, including machine learning and more advanced AI technologies.

As your trusted analytics partner with **end-to-end capabilities**, we can help you make sense of your data and ensure it is fit for purpose while shaping a data strategy that will help realize its full potential. The result is analytics that supports real-time business decisions.

Alongside, we use the full spectrum of intelligent automation technologies, from robotic process automation (RPA) to AI to help you achieve efficient, optimized operations.

CASE STUDY

Using machine learning to predict cracks in steel

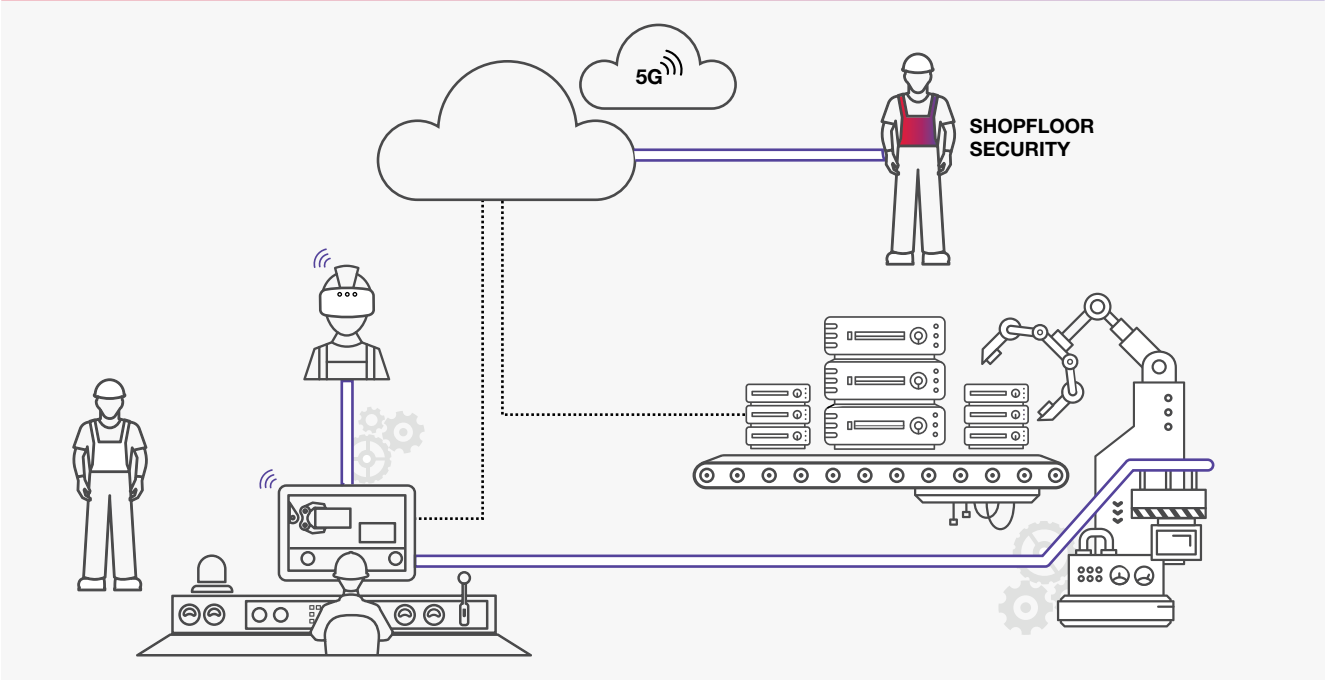
Steel manufacturers cannot assess the quality of their output until the end of the manufacturing process, at which point they can discover cracks in a large amount of the finished product. This damaged steel must be melted and fed back into the production process, wasting enormous amounts of time and money.

Swedish steel manufacturer Uddeholm wanted to improve the manufacturing process by predicting when costly cracks might appear in the finished product. Despite an abundance of data, they were unable to make the best use of it to achieve their goals.

Together with Uddeholm, we developed a high-powered machine learning model that could predict—with over 70% accuracy—where and when cracks would occur. Our approach used big data and an IoT platform to capture and handle relevant data and apply machine learning and advanced analytics to find new insights and gain the necessary knowledge to improve the quality of completed steel.

Learn more

4. IT/OT security



Assessing the risk of your IT/OT environment to implement the right security measures and prevent attacks before they happen

Cyber attacks on manufacturers are rising. Preventing them before they happen is essential to keep workers safe and production lines running. However, most legacy machinery was never intended to be connected to networks and can pose significant security risks. At the same time, employee awareness and real-time assessment are needed to defend against growing cyber threats and unintentional “accidents” and leaks by employees.

We have a 45-year heritage of **creating and securing critical business systems** in complex, environments across the globe, including the defense and intelligence sectors. We have invested heavily in establishing our credentials, working closely with international security associations and standards bodies.

As your trusted advisor, we can provide comprehensive and integrated IT and OT cybersecurity solutions and services that protect the digital factory and secure the digital continuum across the value chain.

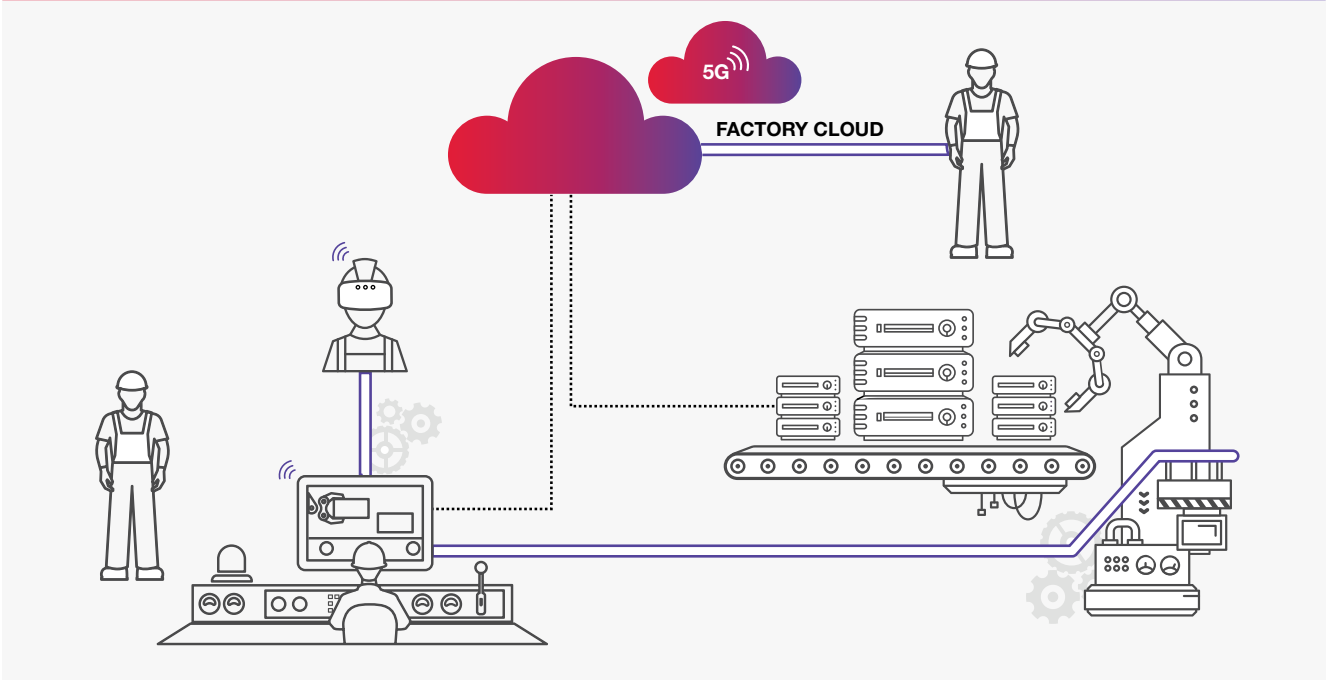
CASE STUDY

Keeping the coffee flowing

Jacobs Douwe Egberts (JDE), the world's largest coffee and tea company, required an overview of the potential cybersecurity risks across its factories worldwide to mitigate possible threats and vulnerabilities. This included all OT computing systems used to manage the entire industrial operation.

Our experts conducted a comprehensive OT security assessment of every individual factory that provided clear insights into the potential security risks. Based on the identified risks, we advised mitigations, developed awareness videos for employees, and helped define OT/ICS cybersecurity priorities moving forward. We were also tasked with implementing the relevant mitigation measures. A complete overview of vulnerabilities has enabled JDE to improve its cybersecurity posture and mitigate risks across all factories.

5. Factory cloud



Hosting OT in the cloud to benefit from a global ecosystem that connects plants, people and partners across your entire value chain

Cloud manufacturing is a key lever for securing market competitiveness and innovation.

Moving manufacturing processes to the cloud can transform the factory and its potential, providing the flexibility and scalability to quickly bring new products and services to market, improve internal and external ecosystem collaboration, streamline processes and lower costs.

We help clients benefit from **cloud capabilities** with a balanced approach that addresses our clients' obligations to protect critical personal or commercial data, protect privacy, comply with regulation and mitigate commercial risk.

Whether designing cloud implementation strategies, assisting in cloud adoption and "lift and shift" migrations, modernizing with **cloud native** and **DevOps methods**, and managing and securing your hybrid, multi-cloud environment, we have the experience and the expertise. Our services extend across your cloud requirements, from strategy, roadmap and governance, to architecture and transformation, to secure operations and managed services.

CASE STUDY

Driving better software

The automotive industry is changing lanes. Electric cars and autonomous vehicles are here to stay. For many automotive manufacturers this shift requires a rapid transformation of their software development capabilities.

A large German car manufacturer responded to this challenge by selecting us to move their software development into a cloud environment and embed agile and DevOps methodologies.

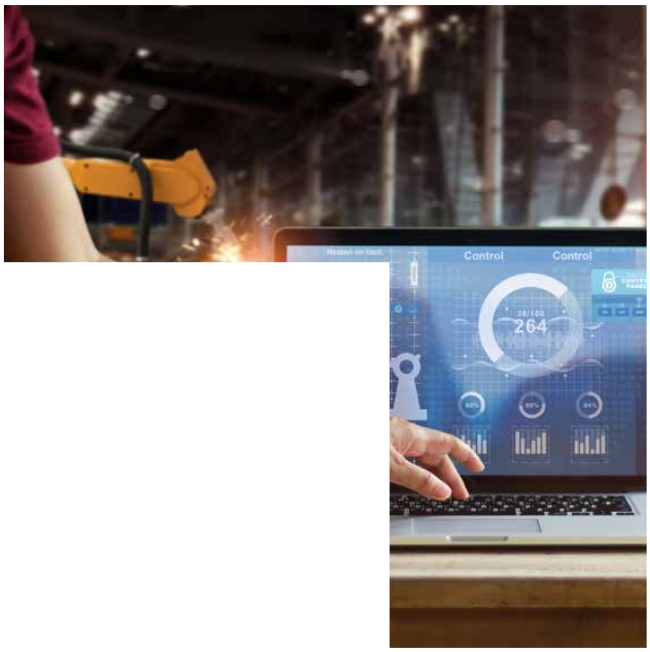
Through our end-to-end consulting, we are supporting the car manufacturer across their entire value chain—from production and sales to customer support and future endeavors in mobility services. The client plans to extend the initiative to all future cloud native development activities and IT modernization with additional volumes.

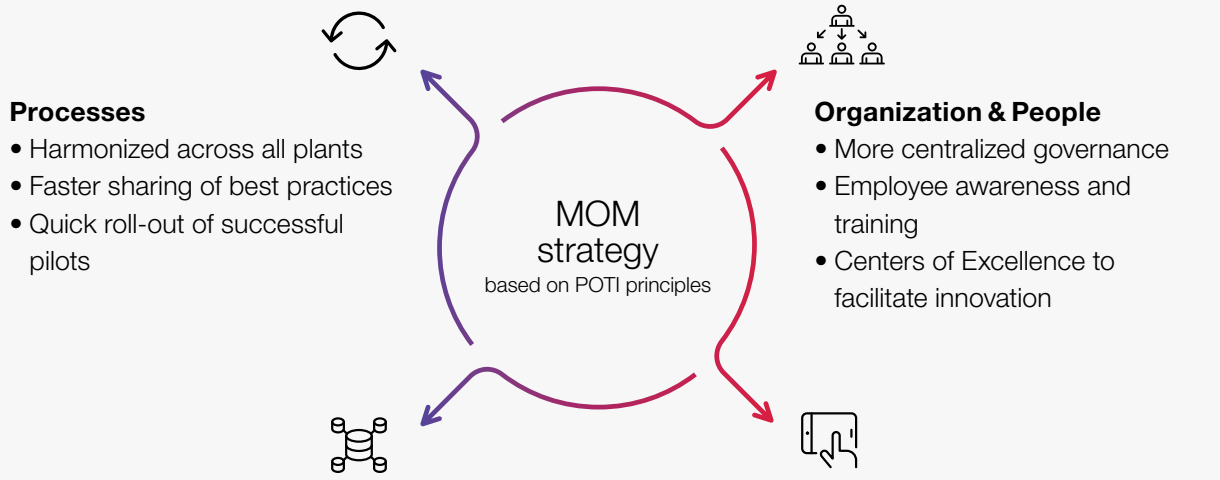
CGI's Manufacturing Atlas

Transforming your manufacturing environment holistically

Successfully transforming into a digital factory requires focusing on four core areas: 1) processes, 2) people and organization, 3) data and information, and 4) technology. It also requires gaining buy-in across the organization for technology initiatives and the right data to harmonize processes. Understanding your maturity in each of these areas and where you want to get to is critical.

CGI's Manufacturing Atlas is a holistic methodology and digital framework that addresses each of these four core areas to help you optimize your manufacturing IT, drive operational excellence and allow greater personalization. Using this approach, we deliver the expertise, best practices and solutions to support your transformation in an agile manner—from completing an initial feasibility study and making an investment decision to rolling out solutions and delivering ongoing improvements.





Processes
- Harmonized across all plants
- Faster sharing of best practices
- Quick roll-out of successful pilots

Organization & People
- More centralized governance
- Employee awareness and training
- Centers of Excellence to facilitate innovation

Information & Data
- Company-wide data availability
- Clear ownership
- Reliable quality and easy access
- Documented and contextualized

Technology
- Harmonized over all sites
- Cloud-based where it adds value
- Horizontally and vertically integrated

Four core areas to consider in your transformation strategy

Supporting your successful journey

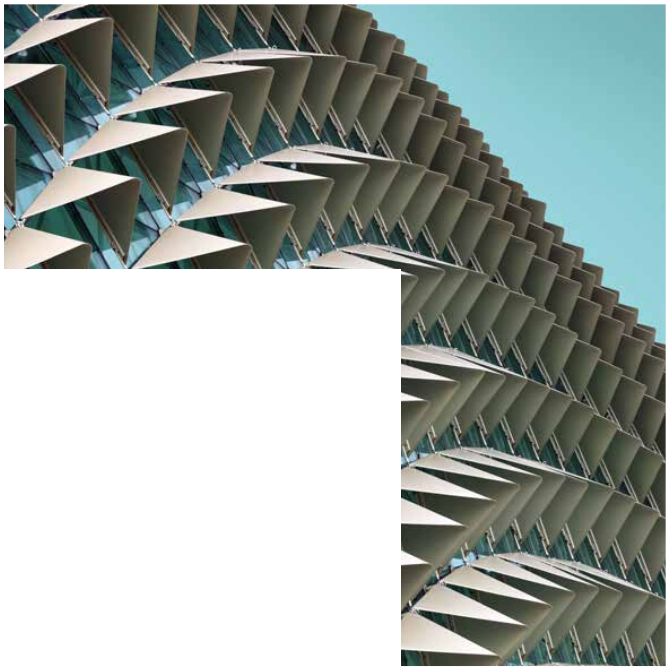
Business success isn't just about where you'll go and how you'll get there. It's also about who you'll team with. At CGI, we are committed to making our story about you and your successful journey, serving as an insightful and resourceful partner.

For over four decades, we have helped leading manufacturers navigate and seize the opportunities of change. Our deep-domain expertise and technical know-how supports over 600 manufacturing clients worldwide across multiple sectors including automotive, chemical, high-tech, metals, mining and natural resources.

Our professionals and consultants work with you to improve business agility so you can drive efficiencies and reduce costs as you continue to advance your strategic goals. Through strategic IT and business consulting services, systems integration, IT managed services and intellectual property solutions, we help you realize the promises of Industry 5.0 and beyond.

Contact us at **manufacturing@cgi.com** to learn how we can support your transformation.

We are proud that our top 10 clients have partnered with us for an average of 27 years, and continue to collaborate with us to deliver market-leading innovations.



About CGI

Insights you can act on

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

cgi.com/manufacturing