CGI's experts discuss:

Transforming into a digital factory

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As part of the Unified Manufacturing roundtable series, CGI experts discuss some of the key topics facing manufacturing leaders today. In this particular roundtable interview, we explore the topic of digital factories, which is at the center of digital transformation in the industry.

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, helping them to be more adaptive and responsive to stakeholder demands. Through deep digital connection, integration of IT and OT, and application of proven business methodologies, manufacturers can realize their strategic vision and achieve an insights-led digital continuum.

Core to realizing this strategic vision is the development and operation of a digital factory.

In this roundtable, CGI manufacturing experts Helena Jochberger, Kathryn Ashton, Ralph Bisschops, Guido Scwartze and Coen Huesmann discuss digital factories and their transformative role in the future of manufacturing.

What does the term “digital factory” mean to you?

Guido:

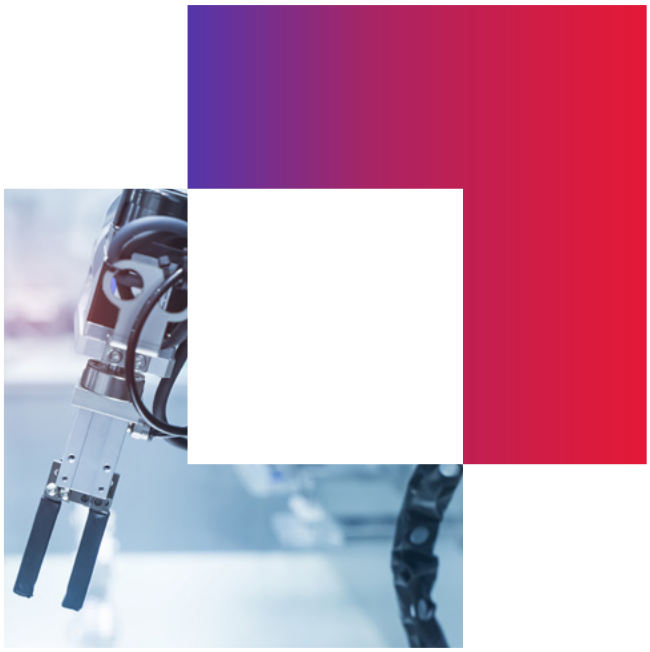
Over the past few decades, we’ve been trying to make factories automatic, and in doing so, we have automated many processes. As we move toward digital factories, processes will become more autonomous. The factory will become a self-steering system that is governed, not by simple rules, but by complex algorithms. This, for me, is key to a digital factory. Whether it’s increasing production of mass products or developing highly customized products, both require us to work with more intelligent systems than we have done in the past.

Kathryn:

From conversations with manufacturers, I’d say that digital factories refer to machines with intelligence that can give information back to the operator and the business on their performance and production levels. Today, this information is necessary to support shop floor resources and optimized operations.

Ralph:

For me, it’s about having a fully aligned factory—from machines to people. It is not just about reaching the highest technological level; it’s also having business and shop floor resources working at that same level. If the factory is ”smart,” but the people don’t know what to do with it or don’t have the skillset to leverage the insight, its goal will not be achieved. So, education and knowledge are key too.



Coen:

Building on that, I’d add that at the beginning of the digitization journey in manufacturing, there was a presumption that automation would make people redundant. That didn’t happen. Instead, increasing levels of automation have allowed people to focus on other tasks. This is the continued focus of automation—removing repetition by using machines and smart technology and freeing people to focus on value-added processes.

Helena:

Yes, I fully agree with your point, Coen. The definition of a digital or smart factory is changing in line with the new vision and ambitions of Industry 5.0 as proposed by the European Commission. It is becoming more comprehensive in that it doesn't just consider technology aspects but recognizes the importance of appreciating and respecting both humans and the planet. Industry 5.0 is an integrated and holistic approach that aims to ensure a human-centric and sustainable industry.

This applies to customers too. With digital factories manufacturers can respond faster to customers' demands by ensuring production is flexible and responsive. Digital factories can also help eliminate some of the more dangerous aspects of manufacturing and improve employee safety.

What are some of the key business benefits of a digital factory?

Kathryn:

In the discrete manufacturing space, machines can tell us, for example, if cutting tools are operating smoothly. We can compare the output by engineering design and operator to then optimize the assets on the shop floor. This will inevitably lead to more efficient production at a lower cost, better product quality and will help to identify production breakdowns. You can then apply each new learning across production lines for exponential efficiency.

Ralph:

In my opinion, the big three business benefits are optimization, flexibility and time to market.

Coen:

Absolutely, in my discussions with our C-level client executives, sustainability is another major driver. Digital factories can help manufacturers produce at the lowest cost and at the lowest footprint in terms of energy, CO2 emissions and material usage. This is a key consideration and benefit for many production facilities.

Kathryn:

Yes, I agree. Another crucial aspect is knowledge. In the U.S., we have an aging manufacturing workforce. If we use technology to capture their insight and knowledge, it will be a much smoother transition for the new generation of workers.

Ralph:

The situation is similar in the Netherlands. The aging workforce will retire and take all the knowledge with them. This is especially true in relation to production facilities where they know the machines like the back of their hand. They know every tiny detail, and as soon as they retire, all that invaluable knowledge will be gone.

Guido:

We recommend clients put sensors on old machines, gather the information and then link the operator's action and the behavior to the machine's output. This is one way of solving this issue, particularly when there isn't an adequate workforce succession plan.

Ralph:

Yes, this is so true. We worked on an asset health project for a client in the Netherlands, and this is exactly what we did. We extracted all the data from the machines and matched it with the knowledge available with experienced engineers. We asked questions like, "we see this in the data; how does it match with your experience?" Together, we were able to build very comprehensive models.

Helena:

What also has become apparent through the COVID-19 pandemic is that the “production on-demand” model is very fragile. If you don’t have an overview of your supply requirements, it will have a huge impact on your customers. Using digital factory technologies, manufacturers can become more connected to their suppliers and responsive to changing levels in demand.

Another key benefit is the rich data that becomes available, especially in the case of discrete manufacturing. Here, products represent complex systems with long lifespans. By having access to continuous, bi-directional data flows (from design and engineering to manufacturing and the supply chain, and finally to maintenance, repair and overhaul processes), it will be possible to realize significant cost reductions while improving processes and products.

What does success look like for manufacturers who are implementing digital factories?

Kathryn:

Their expenses are lower, production is higher, and quality is better.

Guido:

There's also more flexibility and resilience.

Helena:

Yes, in fact, there are many benefits! Another significant and tangible advantage is reduced failure rates in production machinery, resulting in reduced downtime. For several clients, we support the manufacture of parts and optimization of material production through intelligent algorithms.

Coen:

Another advantage is flexibility in the response time of your supply chain from the moment the customer asks for something to the moment they receive it. It's about shorter delivery time. This aspect is critical as we see the mass uptake in online ordering and delivery—especially due to the COVID-19 pandemic—which in turn leads to an increase in just-in-time production. Customers expect to have everything "now." For manufacturers, this means becoming more agile from end to end: agile supply chains, agile production and agile delivery.

Ralph:

Yes, indeed, having an agile supply chain is critical. A recent example of the importance of agility is the global production shortage of electronic chips. We see the automotive industry having difficulties delivering cars and meeting their orders as there are no chips.

Coen:

Another example I can think of from when I worked in the media industry: 80% of all televisions sell between Thanksgiving and Chinese New Year. The average life of a television is very short, as you can buy last year's model at a fraction of the price the following year. Manufacturers, therefore, rely heavily on innovation to beat the competition. However, the end product is made of different parts with different cycle times. The chips, for instance, take three months to produce; it's not an "agile" product. Therefore, a flexible and agile supply chain is critical to innovation in terms of adapting to the cycle times of different parts, to their innovations and their supply chains. There are a lot of moving pieces, and being able to keep on innovating is critical.

Helena:

Success across the supply chain is critical. It ultimately leads to higher customer satisfaction levels and the ability to offer greater levels of personalization. By implementing digital factories, manufacturers are in a better position to provide service-based offerings to customers and really delight them.

Guido:

Absolutely! Innovation in the supply chain and in production lines will drive success. I've seen instances in Germany where manufacturers now have completely stripped the production line because they find the "line" too restrictive and inflexible. The shop floor is basically empty, and work or assembly stations are moved, sometimes autonomously, to wherever needed.

In the automotive industry, for example, a factory that was limited to producing a certain car model can now produce any model. Agility completely transforms supply chains as well as production lines. This enables manufacturers to be fully orientated to the market and allows for greater product customizations.

What are some of the key technologies used in digital factories?

Guido:

Data is fundamental to the digital factory and therefore true connectivity, i.e. connecting assets to data lakes is vital. Manufacturers may need to retrofit sensors on older machines to make them intelligent and a cohesive part of the digital factory unit.

Ralph:

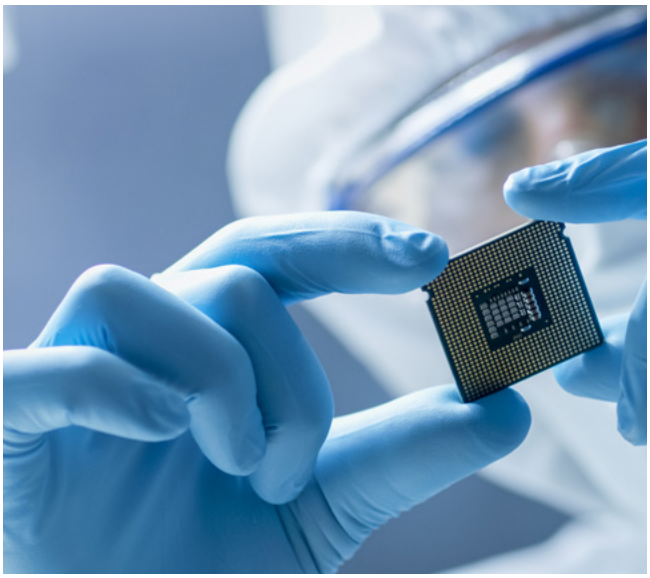
Yes, harmonization of data is a critical first step.

Guido:

I agree. This links back to our earlier point on knowledge mining. In many manufacturing plants, there are processes that rely on unique and finely tuned methodology built over many years, and the operator of the machine holds this knowledge. It is crucial to learn and understand operators' techniques and transform that into data insight.

Ralph:

Yes, though at the same time, we shouldn't forget that we need many standard simple sensors for a complete process: temperature, humidity, pressure, etc. The factory needs to sense in the same way as you or an operator would. It needs awareness.



Helena:

Data is the cornerstone of a digital factory. However, in my view, data is wasted unless you can share it. This is why having the right networks in place to support smart manufacturing is critical. Another underlying technology that is core to digital factories is 5G, as it allows a large amount of IoT devices to be connected simultaneously.

Once data, IoT and networks are in place, then the exciting stuff can happen. For instance, using AI for predictive maintenance and product/process improvements, AR/VR technologies to support collaboration and digital twins to create an organizational mirror.

Are there risks in moving to digital factories?

Ralph:

Security. Moving to digital factories where everything is connected brings new and unforeseen security risks. This makes access to cybersecurity professionals crucial.

Coen:

Another risk is becoming dependent on technology too fast when your people and/or your processes are not aligned yet. There needs to be a balance. Your organization has to be ready for this change; otherwise, you risk your investment. Aligning your organizational culture is key.

Ralph:

Furthermore, as you start looking at the data, you may find a lot of inconsistencies. There could be revision, evaluation and rework needed to sync all your machines. There could also be silos that need to be bridged. This requires going back to the system or the machine owners, and you may come up against internal resistance. Managing this process can be complex. You need to have experience running these transformation programs so that both the stakeholders and the organization are aligned. It is really important that the journey to becoming a digital factory is started and taken together as an organization.

Security certainly is a critical consideration. However, there are other ”softer” risks when looking at the organization as a whole. There may be cultural hesitancy at embracing changes in technology and processes. These need to be managed sensitively and holistically by ensuring the right change management processes are in place for a successful transformation. The work involved in any transformation program is often underestimated, as Ralph eluded to on the data side. This can be true of other processes as well.

What are some of the first steps manufacturers can take on their journey to a digital factory?

Coen:

I wouldn't say there are standardized first steps, but there is a maturity in this process. There is a way for factories to move from silos to working as fully integrated and harmonious organizations and from highly people- and paper-intensive processes to autonomous production. Each manufacturer must look at the evolutionary steps to take toward achieving their vision, strategy and goal. There are industry-wide models as well, such as Shareable Content Object Reference Model (SCORM) for supply chains and ISA95 for production, that serve as good starting points.

Helena:

There certainly is no "one size fits all" answer. Every company has its history, industry requirements and challenges. Consequently, performing an audit and assessment exercise is a critical step to identify and clarify concrete business demands and expectations and build the vision and roadmap.

At CGI, our Manufacturing Atlas methodology helps clients gauge where they are in this journey and identify the next steps to achieve their vision and business outcomes. Manufacturing Atlas is an approach for supply chain improvement that takes into account all aspects of the factory, from people and processes to technology and information.


LINE A
LINE B
LINE C
PERCENTAGE
PERCENTAGE
PERCENTAGE
balance
energy
SYSTEM
100%

Helena Jochberger
Vice-President,
Global Industry Lead,
Manufacturing
Austria

As the Global Industry Lead for manufacturing, Helena Jochberger is responsible for the strategic design, development and direction of CGI's global manufacturing portfolio. In this role, she supports client relationship development, drives decision-making on industry strategies at both the global and local levels, steers investments in growth areas and solutions, and engages with senior client executives to accelerate CGI business units' growth plans. A certified design-thinking facilitator, Helena is highly experienced in digital transformation and change management and is a thought leader on these topics.

Kathryn Ashton
Director,
Consulting Services,
U.S.

As part of CGI's Business Consulting group, Kathryn Ashton is responsible for industry, market, competitive and comparable research for the U.S. manufacturing industry. In her role, Kathryn focuses on strategy, business development and thought leadership. She drives innovation workshops and the market design, development and commercialization of strategic products. Kathryn joined CGI in 2018 with more than 20 years of manufacturing experience, ranging from strategy and business development to program management and solution architecture, and expertise in the Industrial Internet of Things (IIoT).

Ralph Bisschops
Senior Consultant,
Netherlands

With over 20 years of experience in the manufacturing and oil and gas sectors, Ralph Bisschops is passionate about helping clients improve business and technical processes to drive forward their digital transformation. In his role as an IoT and smart solutions consultant at CGI's Manufacturing Center for Excellence, Ralph supports clients across the various phases of their digitization journey, from consulting through to implementation. His in-depth knowledge of communication technologies and experience in implementing IT systems in harsh industrial environments helps to take ideas from the drawing board and transform them into tangible business outcomes.

Coen Huesmann
Vice-President,
Consulting Services,
The Netherlands

Coen Huesmann leads CGI's Manufacturing Center of Excellence (CoE) in the Netherlands and a broad team of industry and technology experts. With extensive international management experience in Lean, smart manufacturing and supply chain management, Coen helps global manufacturers bridge their operational technology (OT) and information technology (IT) landscapes while supporting their digital transformations. In his role, he works with manufacturing companies, helping to optimize operations, build agile supply chains, and leverage CGI's proven Manufacturing Atlas methodology to improve efficiency, reduce costs and gain the benefits of new and emerging technologies.

Guido Scwartze
Executive Consultant,
Germany

Guido heads the Industry 4.0 practice for CGI's operations in Germany. With his well-founded knowledge in innovation management and smart manufacturing, Guido helps clients design smart products, digital processes, and business models for their operations. He focuses on helping clients transform through technology-driven innovation, guiding them from strategy development to successful implementation and go-to-market execution.

About CGI

Insights you can act on

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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.

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