



# Cognizant<sup>®</sup>

## Manufacturing Reinvented

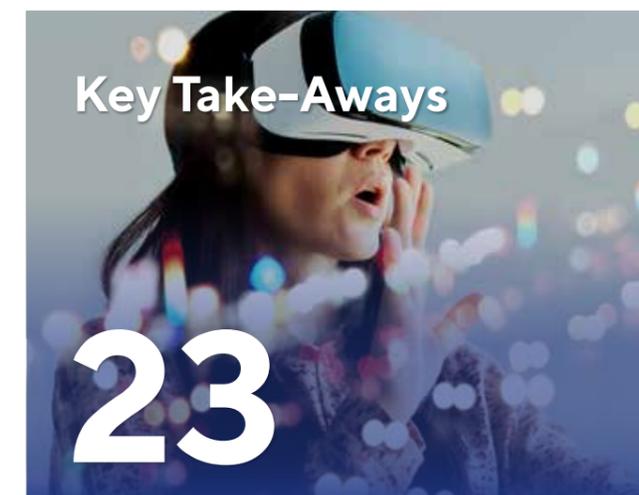
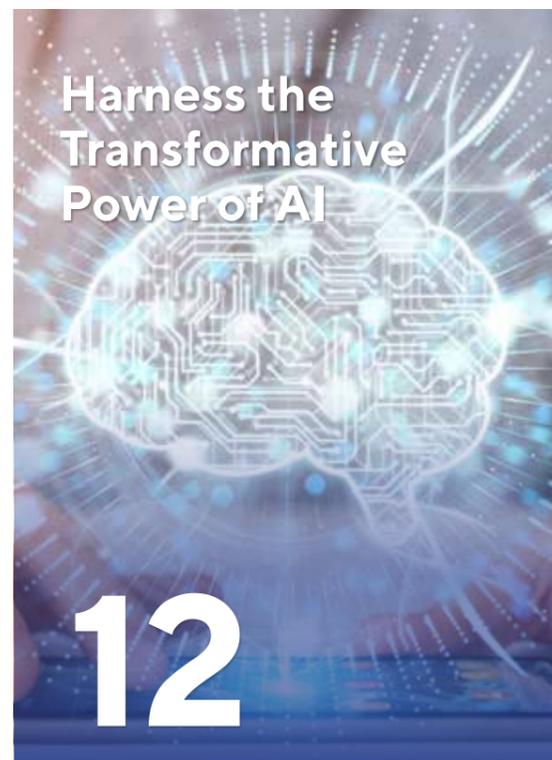
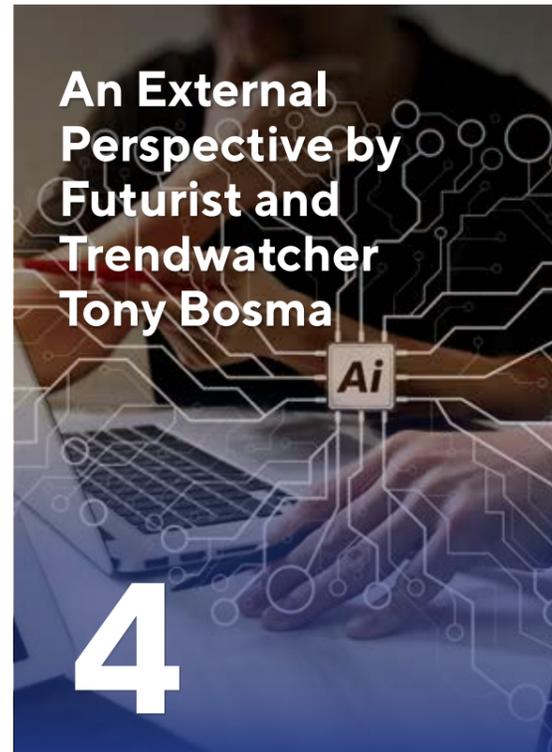
Learn how AI can play an important role in staying relevant and how you can seize business opportunities by applying digital technologies. The manufacturing industry has been heavily impacted by the digital developments of the last decade. Read what the future will bring for your industry to cope with digital transformation & innovation.

The future of manufacturing will offer a world of opportunities, a transformation that will require substantial steps and boldness. The industry needs to be open to new insights instead of mentally closed by the existing ones.

Each industry has its own challenges, and digital disruption is everywhere. Organizations must be agile and build new momentum that respects the new reality of their industry. Remaining relevant requires adaptation to changes not only today, but also tomorrow. Change is the only constant. Constant change demands scenario-based thinking, exploring several paths and crafting a digital strategy based on preparing for the future. For businesses to stay relevant, they need to explore the future and look at next generations.

No one can predict the future; organizations must actively explore various possible futures to anticipate what disruptions are coming. We believe that future winners in the digital economy will be those that can deliver on one key insight: put technology in the background, and focus on people first. Putting customers first does not diminish technology's importance; rather, a deep customer understanding should help guide the choice of which technologies to incorporate in your business.

Cognizant can bring together digital strategy, deep industry knowledge, human sciences, experience design and technology expertise to help companies design, build and scale digital business solutions. Cognizant has both expertise and experience with digital transformation. Together with clients, we can explore tomorrow's opportunities.





## An External Perspective by Futurist & Trendwatcher Tony Bosma

# Manufacturing Reinvented

Tony Bosma (1973) is a futurist and trendwatcher. He is the founder of futuring and consultancy organization Extend Limits ([www.extendlimits.nl](http://www.extendlimits.nl)). Extend Limits does not predict the future but helps organizations anticipate it. Do not ask yourself why things are happening. Ask yourself, "Why hasn't it happened yet?" This is the mindset companies need to adopt in this era of change.

Tony Bosma is an authority in future thinking and trendwatching and was nominated in The Netherlands several times for trendwatcher of the year. He is an internationally renowned keynote speaker. He is known for his confronting, inspiring, visually attractive and surprising sessions about a wide variety of topics. He also works for a variety of companies and governments, helping them anticipate the future and, more importantly, challenge and question today's world and mindset.

In collaboration with Cognizant, Tony Bosma did extensive research into near future trends across industries. Together with Cognizant, he made abstracts of the most dominant developments – not far fetched futuristic worldviews – but realistic developments which are seen right now. These are not only plausible future developments but also the challenges of technological developments.

The Fourth Industrial Revolution (Industry 4.0) introduces many radical innovations and technological developments. While many of these advances will impact manufacturing, most are still in the pilot phase and haven't been deployed at scale. However, new and increasingly intelligent technologies offer remarkable opportunities for manufacturers to gain competitive advantage, as well as much-needed change in an industry that, for the past few decades, has been slow to take fundamental steps toward a future that demands a shake-up of traditional processes and ways of working.

Now is the time to really rethink and reshape the industry. But while opportunities await, radical innovation requires not just speed but also vision, persistence and direction. To successfully execute on Industry 4.0 initiatives, the industry needs to stop focusing only on efficiencies and open its mind to how its processes, products and services can be reinvented in ways that benefit customers and society as a whole.



The future of manufacturing is smart, interconnected and flexible. It's technology-enabled but human-driven. To achieve this vision, the industry will need to adopt a fundamentally different mindset – from its current focus on "cheaper, faster and more efficient" toward "smarter, disruptive and more collaborative."

Although change is happening in manufacturing, it's also a very conservative industry when it comes to adopting new technologies. Manufacturers have historically focused on operational improvements. As a result of constrained resources and available factory capabilities, innovations have traditionally been required to have a clear ROI and minimal impact on existing business operations. Competition and a lack of in-house skills have also made it difficult to radically innovate and embrace

change. According to McKinsey, more than 70% of industrial companies are still either at the start of their digital journeys or unable to move beyond the pilot stage, even as productivity growth seems to be decelerating in many Western economies.

When we look at the factory of the future, however, manufacturing will move beyond traditional automation and toward a fully intelligent and connected system, aided by 5G networks, smart sensors, artificial intelligence, robotics, smart materials, quantum computing, nanotechnology, biotechnology and 3D printing. But while extremely powerful, these new technologies are also much more difficult to deploy than previous technologies, as they require changes in the manufacturer's organizational structure, culture and, above all, mindset.

**“Nations who invest in exponential manufacturing technologies and innovation ecosystems will emerge to be more competitive than those who choose to compete on price alone. Higher value, advanced products, and processes that require excellent product quality and deliver greater margins are driving faster, permanent innovation.”**

*World Economic Forum*

Manufacturing Reinvented **05**

# Beyond the Four Walls

So the question is: will this new wave of technological developments really result in fundamental improvements, or is the manufacturing industry too far behind the needed change? What are the most fundamental technological trends and developments for the future of manufacturing, and how transformative will they be?

The factory of the future will not be limited by its physical walls and on-site machines. We will see growth in the industry when new technologies are implemented at scale across the value chain, shifting the supply chain from linear to interconnected ecosystems. This requires looking beyond the four walls of the factory and connecting manufacturing processes with the outer world of suppliers and customers.

Connectivity, integration and converging technologies will help manufacturers meet the growing demand for low-volume, more customized and more complex products. These are also the biggest challenges for the industry. Expanding beyond the factory walls requires not just strong collaboration among operations technology, industrial automation and information technology but also a change of mindset and trust in each other and technology.

## Smart as the New Normal

The merging of cyber and physical systems with the outer web will make the smart factory a reality. True power and progress for manufacturing lies in the creation, enhancement and real-time sharing of data and information throughout the value chain. Cognitive technologies like machine learning, computer vision, speech recognition, data analysis and artificial intelligence (AI) will fuel this development, all working together to create a network of machines and technologies that use data to do the right things and do things right. Machinery and manufacturing equipment will no longer need to follow explicitly programmed instructions; instead, by being exposed to real-time data from the value chain,

these networks will be able to self-optimize, improve processes and even reorganize processes based on demand in the value chain.

To accomplish this, data collection will become key. Smart sensors will monitor specific processes throughout the factory, and smart robots will continuously monitor material handling and adjust production if needed. Dynamic manufacturing will become a reality due to smart equipment enabling different production settings for lower-volume production, minimizing downtime for retooling and reprogramming factory equipment.

## Merging Worlds

Manufacturing will also transform from a reactive to a predictive approach. Traditionally, the most common way to get information about the complex and critical systems used in manufacturing was physical inspection by humans. With advanced technologies, however, we'll see the rise of digital representations of machines, processes and products. By connecting the physical assets to the digital world and creating an identical digital representation, also known as a digital twin, businesses will be able to create, test, build and service future products before they're physically manufactured.

As such, the virtual world will become the ultimate playground for future products and services. Extreme flexibility will become a reality, as requirements and factory processes can first be tested virtually. By the time factories manufacture goods, everything will perform according to the desired requirements. Virtual representations will also be used to self-diagnose needed maintenance in real-time.

## Autonomous Machines on the Horizon

Veterans of the manufacturing industry might remember the introduction of the Unimate 1900 series in 1961 by General Motors. It was the first official mass-produced robot arm for factory automation. In 1966, Unimate became world-famous in its first television appearance on The Tonight Show in the U.S.



Now, manufacturing is about the combination of cyber and physical systems, blending the physical, digital and biological worlds. The network of all these different technologies will ultimately create so-called "lights-out" factories, where intelligent systems will execute processes that don't require human dexterity or problem-solving skills. Autonomous systems will divide tasks like assemble, pick-up and hand-over. Robots will decide by themselves which tasks can best be handled autonomously and when. Although these advanced factories are still rare today, they will become the new normal.

The most well-known example of the autonomous factory is the Fanuc plant in Japan, where robots build other robots. The way toward this future is through the use of co-bots, or collaborative robotics, which work safely and harmoniously together with their human counterparts. Humans will go from planning and performing manufacturing tasks to problem solving and orchestrating innovative solutions based on societal needs and technological possibilities.



## A View by Cognizant Center for the Future of Work

# Meet the Customer of the Future

### From Assembly Line to Assembly Circle

Today's manufacturers enjoy a straightforward, transactional relationship with customers. The resellers' orders come in, and human workers control machines that pump out the products. And while data can help estimate the amount of specific product that will get sold based on previous sales figures, it's always a bit of a guessing game. And unused product and materials end up in a landfill, along with tons of manufacturing waste.

In recent years, manufacturers have looked to technology to optimize production and reduce waste. In an increasingly competitive market, lowering the cost of ownership in factories and logistics is a key differentiator. But as the sharing economy grows in popularity and customization becomes the norm, manufacturers must explore the potential of technology to truly shift the paradigm of how consumers use – and reuse – products.

### Opening the Loading Dock Doors

So, what does manufacturing look like when everything goes personal? First, customer interactions will be enhanced with intelligent voice-based assistants and IoT to make service, ordering, advice and self-diagnosis more agile, accurate and applicable. And as customers become more comfortable dealing directly with manufacturers, they'll leave behind the retail middleman and work directly with manufacturers on their desired products.

Soon after, mass production will likely become a thing of the past. The next industrial revolution will be all about automated production of made-to-order goods. And production will just be one step in a circular process. Manufacturers will partner with retail, home supply and other producers to expand their capabilities, so that customers can get exactly what they want, in any color they want, at any time they want. And manufacturers will be responsible for a full array of product service after purchase – from repairs to recycling to reuse – so that waste is minimized, and products can be repurposed.

Of course, no one can talk about Industry 4.0 without talking about robots. In Japan, the fully autonomous Fanuc plant uses robots to build other robots. While some fear that such developments

will force humans out of a job, countless studies show that the most powerful team in manufacturing is still a human-machine interaction. The robots do the physically demanding, technically sophisticated work. The humans keep it all under control and ensure nothing goes wrong. In France, Kraaft.co is already using voice recognition and natural language processing to improve human-machine interface on the factory floor.

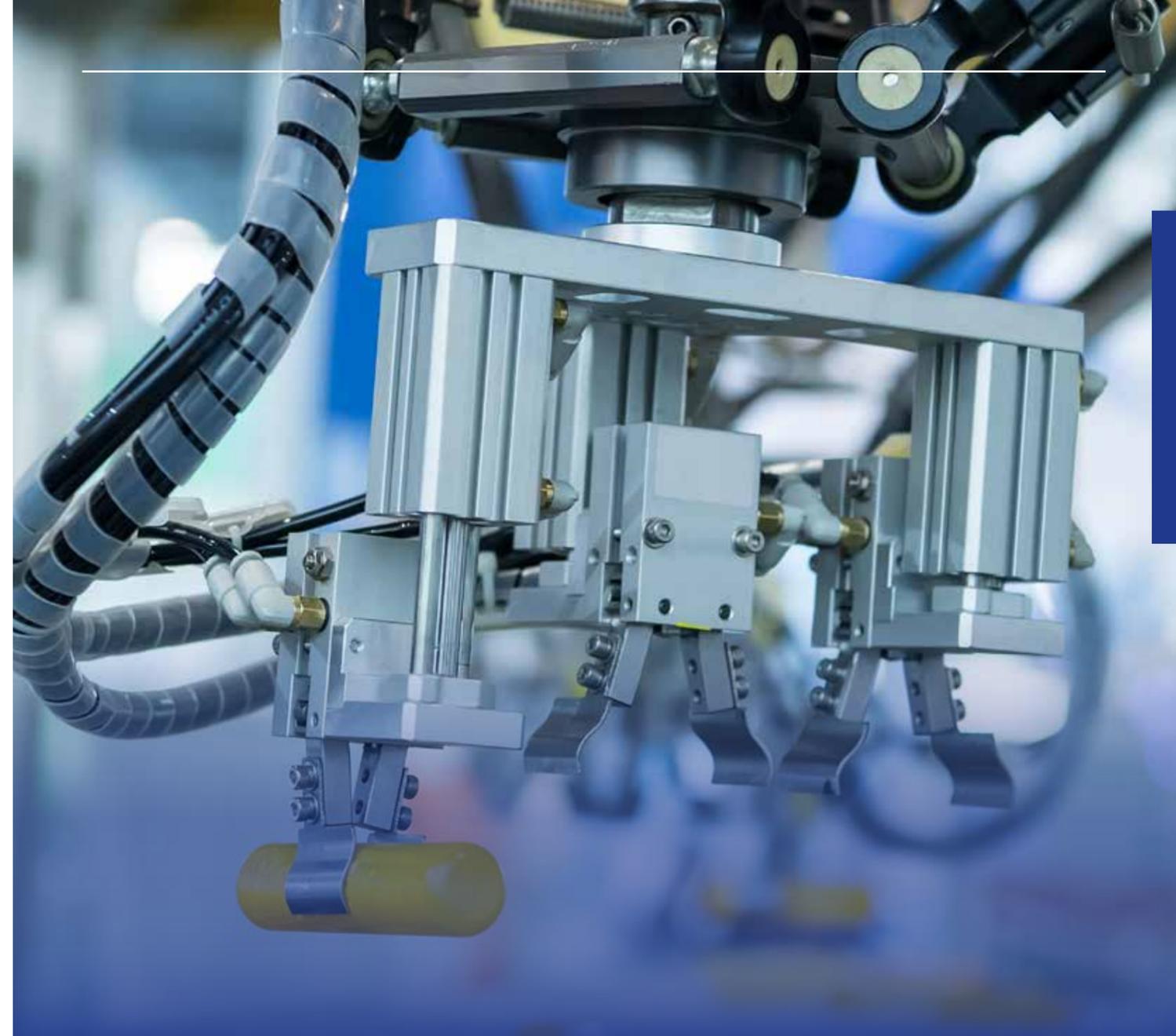
“In the years to come, customers will demand far more personalized products.”

### Disrupting the Links in the Chain

In the years to come, customers will demand far more personalized products, at the same level of speed and quality as today. So the coffee maker they order on Amazon will still arrive the next day, but now, it will be the exact, customized color they specified. Clothing will be made to order, to exacting color and size specifications, and returned to the factory for recycling when it's no longer in use. People will no longer buy products – they'll borrow them.

For manufacturers, this means deep investment in technology. The shifting paradigm will affect every aspect of the work, from raw material acquisition to delivery and logistics. And with AI and machine learning, factories will become predictive and waste-free. The circular manufacturing process will not only eliminate waste; it will also possibly replenish the supply of materials that have already been depleted.

Several companies are already getting a head start on the new industrial revolution. In Slovenia, Origintrail uses blockchain technology to create trusted data sharing to global supply chains. And Deevio in Germany is automating visual inspections, using smart algorithms and image classification.



### The Future of Manufacturing is Human

These developments in manufacturing provide profound opportunities for new, up-and-coming manufacturers. While four or five major players currently dominate the market, in the future, those manufacturing giants will have a much steeper learning curve, and a much longer journey to optimization. In the meantime, smaller, more agile market players can shift quickly into providing the services that customers desire.

In the new era of manufacturing, even borders will be erased. There will be no need to ship product or materials overseas. A manufacturer will simply configure the dimensions and specifications for a product, and send a digital file to the country in question. Then, local producers can print and ship the product to its destination. Or better yet, the customer can print it themselves.

## Quick Take Post COVID-19 Impact

The manufacturing sector has been invaluable during the COVID-19 crisis, from making and distributing everything from hand sanitizer to ventilators, this sector has pivoted to the production of essential goods that are making a real difference.

Post-COVID, these lessons in adaptability will prove essential as consumers look for an ever-increasing degree of personalization and one-off production of goods.

# Manufacturing Reinvented

## New Challenges and Questions

We've faced the prospect of mass automation in factories for decades. Now this vision is becoming a reality. As the industry envisions Industry 4.0, in fact, technologists and futurists are already thinking about Industry 5.0. But with all the new digital opportunities, are we addressing the real challenges faced by the manufacturing industry? Will this new industrial revolution result in a world we want to live in?

Manufacturing is a potent force for improving the standard of living worldwide by creating a more human-centric, environmentally-minded and sustainable world. This demands forward-thinking engagement from the industry and a changed mindset from "doing less bad" toward "doing only good" and from becoming sustainable to becoming circular and resilient.

Is the industry asking the right questions and doing the right things to create our future world? As machines redefine manufacturing, a new set of ethics and morals need to be adopted. Is everything that is technological possible also desirable? The manufacturing industry will be confronted with questions it had never considered before.

New technologies in manufacturing will change the concept of ownership, ethical production and what and how we consume. It will create borderless societies, affect the relation between organizations and consumers and change the balance between work and leisure.



“More jobs will be **created** than are lost from **the AI revolution.**”  
*World Economic Forum*

Technology-driven ecosystems will be fueled by real-time consumer data. Wearable devices and smart assistants – already a part of our everyday lives – will be connected to suppliers and commercial organizations, which will use that data to predict individual consumer needs and adapt products and manufacturing processes accordingly. As products become more digitized, physical distribution will become less critical, as digital files will be sent and printed locally. This will disrupt taxation codes and change the concept of inter-country import and export. Ethics and transparency in manufacturing will also become more essential as consumers increasingly demand ethical production and manufacturing.

What will the future of factory work be? Do we need to shift power to machines – and do we want to? Even with increased automation, the intent of the Fourth Industrial Revolution is not to turn the human workforce into machines and cyborgs but to humanize work. The goal is to harness technology to differentiate us from machines, assigning inhuman tasks to machines and freeing human workers to utilize their unique skills and capabilities in production processes. To accomplish this, manufacturers will need to facilitate collaboration between technology and humans, which in turn will require upskilling the

workforce to take on new responsibilities. Some have gone so far to say that human learning will be even more important than machine learning in the future of manufacturing.

The most vital question in this technology-driven industrial revolution is: how will we all benefit? Are we creating a new inequality between digitally rich and digitally poor individuals and countries? As we witness the rise of digital monopolies – and some companies becoming even more powerful than countries – will technology result in inequality between organizations? Even if all manufacturers increased their investments into new technologies, leading organizations would still reap all the benefits and gain enormous competitive advantage.

Those that avoid risk or have fewer opportunities to harness technology could quickly become irrelevant. Will the world of manufacturing transform toward only a few worldwide suppliers? A study by the Organisation for Economic Cooperation & Development concluded that the gap in performance between the best companies and the rest is widening. New monopolies within manufacturing are on the horizon, and we will see a significant reordering of manufacturing nations.

# Harness the Transformative Power of AI

Artificial Intelligence becomes the engine of our new world. It is the artificial pillar and backbone of our lives and in our societies. An engine that enables us humans to rebuild the world we have become so accustomed to. A world in which we all become data-generating entities just by living our lives. Everything we do, the places we are and the connections we make transform into data. All this data will be used and analyzed to gain insights and enhance our individual lives. It will be magnified to predict hyper-personal forecasts and insights. It will allow us to transform societies for the good and the better, but it will also put us humans to the test. Will we use the power of data and AI for personal gain or will we be able to share it with the whole world? Will we be able to use the transformative power of technology to truly enhance humanity?

Data and AI are already rapidly transforming all industries and dominating our personal lives. They are altering the world and raising important questions for society, economy and governments. While they offer bounds of opportunity, there is also a growing necessity to discuss the morality of the future of AI. We live in a liquid digital world where change has become the new normal. Adaptability must become the norm for companies, governments and individuals, and data and AI will provide the tools and information to adapt to these changing environments. AI is developing to be our greatest friend and foe; a digital tool that will change what it means to be human in the near future and drive business.

“Machine learning is the last invention for mankind.”

**Nick Bostrom**  
Swedish Philosopher

## Reimagine the Past

The development of AI goes way back to the first half of the 20th century. AI research, as a scientific discipline, was founded in 1956 at Dartmouth College. From that moment, experts and philosophers imagined a world of intelligent human-like machines. It even became a popular subject for movies and television shows; at the time, most of them were considered scary. Fast forward to the 21st century and we have entered an era where machines and humans are merging. AI has become so sophisticated that it is becoming more difficult to see the difference between machines and humans. The technology evolved from science fiction visions and robots to self-learning and evolving machines that are involved in every aspect of our lives. AI may even try to mimic the human brain and eventually excel it in the far future, though this stage of resemblance to human-level AI is still many major scientific breakthroughs away.

“Predictions: By 2026 AI will be capable of writing school essays and by 2049 the next Stephen King; by 2027 self-driving trucks will become possible and by 2031 AI will outperform humans in the retail sector. By 2137, all human jobs will be automated.” (Oxford University’s Future of Humanity Institute, AI survey: When Will AI Exceed Human Performance?, under 352 AI experts)



“88% of Europeans believe that AI should be ‘carefully managed’ on the basis of its potential to result in harmful societal outcomes.”

**European Commission, 2020**

## A Once Unimaginable Future

In the year 2020, algorithms help humanity fight the global pandemic by developing treatments and making physical contact unnecessary. Algorithms develop the first vaccines. AI decides between life and death by predicting time in intensive care units and survival rate. Algorithms used by fire departments optimize medical emergency responses. Banking algorithms predict the possibility of fraud and detect lies in our voices. Algorithms analyzing our lifestyles effect our insurance premiums. Autonomous systems redefine the transportation sector, and AI systems enable retail to become fully predictive, personalized, and adapting. AI develops our future products and helps us get over a recession. Our cities become smart and houses anticipate our desires. Preventative algorithms transform security from reactive to preventative by analyzing people likely to become future perpetrators. AI is involved in every decision we make and customizes products and services. Even a product connected to electricity has AI in it nowadays. Algorithms help define our governments’ policies. Future smart

machines are transforming into an all-knowing interconnected neural network of which decisions made and influenced by machines are harder to understand.

## Trust in a World of Fake and Bias

AI is becoming so sophisticated in the upcoming years that we are entering an era where we cannot trust our own eyes and ears anymore. AI blurs the line between real and virtual humans and dissolves into society as a ubiquitous force. Concerns rise about how the enormous advances of AI affect what it means to inherently be human and live in a world where machines have become such an important part of our lives and fake has become so realistic; a world where fake is the new real. What does it mean to live in a world where machines nudge us towards healthier and safer lives? What about the exercise of free will and existence of privacy? The biggest risks of smart cities is that we dissolve humanity and unlearn to live in a world where risks and uncertainty are also a beautiful and essential part of human life. AI and the ‘datafied’ society bring us unprecedented opportunities but also demand to think about the future society we are creating with every AI tool we bring into use. We need to put ethics at the center of every technological development.

## AI and its Compelling Myths

Looking at the enormous investments, promises and stories about AI, we must also be realistic about the truth behind these visions and headlines. There is no denying that AI is still in its infancy and isn’t able to really understand the purpose it is used for yet. So how intelligent is AI? Maybe it is more realistic to name it “machine thinking” so there is no link with any kind of human intelligence? In today’s world, we humans are much more like machines: using our unique intelligence for things machines can do better. So in fact, the biggest risk is not that machines are replacing us, but that we humans resemble machines too much.

# Real-Life Cases

## Virtual Humans = Lifelike

Probably the most known virtual influencer is Lil Miquela. She has more than 3 million followers and acts as an influencer for several brands, all while being fully digital. Today's human models are concerned about their virtual counterparts. The future of Computer Generated Supermodels like Shudu ([www.instagram.com/shudu.gram/](http://www.instagram.com/shudu.gram/)) and Imma ([www.instagram.com/imma.gram/](http://www.instagram.com/imma.gram/)) will be the first examples of virtual humans that will transform society.

## The Diigitals

Works with fully digital models who look like real humans. [thediigitals.com/models](http://thediigitals.com/models)

## CitizenMe

Take back control of your digital self. Reclaim your online data and unlock the real value of that digital data. That is what CitizenMe is providing. It is CitizenMe's purpose to bring people and organizations together by sharing data for mutual benefit instead of only the benefit of many companies using online data. [citizenme.com](http://citizenme.com)

## Levity

Levity makes AI available for everyone. The start-up facilitates everyone to create AI for repetitive tasks. This will enable organizations and individuals to automate what could not easily be automated before. [levity.ai](http://levity.ai)

## Drone Hopper

Drones are becoming the new normal. They are being developed to autonomously do a variety of tasks. Drone Hopper was founded in 2016 and is located in Spain. The start-up makes several drones for tasks like firefighting wildfires, agricultural work and other emergency tasks. [drone-hopper.com](http://drone-hopper.com)

## Tractable

This start-up develops AI solutions for accidents and disaster recovery. The main purpose is to allow faster and more efficient settlement of claims when disaster strikes. For this, Tractable made an AI tool that is able to assess damage using satellite, drone or smartphone imagery. Appraisals can be made instantly and be integrated with repairers. [tractable.ai](http://tractable.ai)

“Predictions: By 2026 AI will be capable of writing school essays and by 2049 the next Stephen King; by 2027 self-driving trucks will become possible and by 2031 AI will outperform humans in the retail sector. By 2137, all human jobs will be automated.”

*Oxford University's Future of Humanity Institute, AI survey:  
When Will AI Exceed Human Performance?, under 352 AI Experts*

There are many myths surrounding technology. Ones such as, “AI will soon surpass human intelligence and replace all human jobs”, “We will never be creative again” and even, “We will cheat death”. The biggest myth remains that AI will solve all of humanity's problems. This is a very simplistic worldview underestimating the complexity of our society and human life. We have to be realistic that AI will be a powerful tool to enhance humanity, but the biggest challenge will remain in redefining our current systems and changing human behaviour. AI has created a groundswell of excitement and promises, and investors are lining up in turn. However, many times it is forgotten that humans make the real future and are responsible of the success of AI.

## The Future is Augmenting Humans

The future isn't just technology. It is technology augmenting humans. The combination of data with AI enhances our capacities. The dominant digital world makes our unique human capabilities: reasoning, emotion, attention, understanding, communication and cooperation more important. AI will amplify human productivity, effectiveness and adaptability. Smart systems working with a continuous flow of data will work with sophisticated decision-making analytics. They will interact with our surroundings and us by recognizing patterns, speech and even emotions. In nanoseconds these systems will see patterns and relations all over the world and transform these into real-time desires, services and products. All this keeping the much-

needed balance between humans and planet as a starting point. AI will enable a more customized future but will also connect us with more uncongenial people to broaden our horizon. Yet, most experts, regardless of whether they are optimistic or not, expressed concerns about the long-term impact of these new tools on the essential elements of being human. All respondents in this non-scientific canvassing were asked to elaborate on why they felt AI would leave people better off or not. Many shared deep worries, and many also suggested pathways toward solutions.

By 2030, most social situations will be facilitated by bots – intelligent-seeming programs that interact with us in human-like ways. “The biggest threat to humans isn't evil AI but humans using AI for evil.”

## AI be Good

The future of AI is mind blowing and for many unimaginable. The SAGE project done by The Intelligence Advanced Research Projects Activity (IARPA), a US government agency, is such an example. This project uses AI to predict the future of geopolitical events. It can smell disease from a human's breath and even read our thoughts and turn them into words and images.

But there is still a lot of uncertainty within the developments of AI. And when uncertainty dominates our vision, doom and gloom

are on the horizon. From computers exceeding human intelligence and the loss of control of our lives, to a world where data is abused by monopolistic organizations to nudge us into consumption of their products, a world of mayhem, job loss, and even autonomous weapons. The future of AI is in our hands; what matters is what humanity does with it. To be ahead of the negative scenarios, we need to anticipate possible outcomes. More than ever, it is necessary to start the dialogue with society about the future of these technologies. Educating our children on how to deal with smart machines and make them machine aware. Governments need to build legislation to counteract the downsides of technological innovation.

AI will do good for humanity. It can increase agricultural productivity, resolve human bias, help education to personalize to people's learning styles, fight disease and poverty and make human life sustainable. AI combined with data could and should bring back balance to our world. That's the biggest challenge of AI and data. Let us not forget we are responsible for that!

# The Future of AI in Manufacturing

The future of manufacturing is challenging and futuristic. Technologies like AI will help the industry to meet quickly changing demands. Volatility is the new normal in markets and AI enables manufacturers to become adaptable to both disruptive technologies and the ever-changing requirements of B2B markets. Industrial consumerism is on the horizon: a world where customers demand hyper-personalized products and services. In this new reality, manufacturers need to shift towards not only focusing on efficiency, but also on smart products and radical new ways to create value. The true potential of AI in manufacturing will be recognized when it is combined with up and coming technologies like sensing, robotics (globotics), merged realities and network technologies (IIOT). The pandemic proved how technologies like AI guarantee the continuity of manufacturing and it gave insights to their future advantages. Artificial intelligence is the future backbone of the manufacturing industry.

AI enhances every single aspect of the industry and, when combined, transforms the face of manufacturing radically. It enables the industry to optimize and enhance the way products are made and designed, from better insights by real-time client engagement and interaction, to automated design and creation of smart products. Production becomes trustworthy with advanced demand forecast by AI and preventative maintenance of machines. Predictive forecasting puts more control in the hands of the industry. It enables the companies that know how to use AI to become anticipative to the market's volatility.

“91% of industrial companies are investing in digital technologies for factories. 6% of the respondents describe factories as being ‘fully digitized’.”

PWC, 2020

## AI: Predict and Prevent

In a complex world where production is always under pressure the necessity to-know things beforehand is essential. Unfortunately, the manufacturing industry still faces many errors and defects. Changes in demand make forecasting one of the holy grails of

manufacturing. Recognizing potential changes in demand volume or product changes will prevent costly stocks. Predicting and anticipating possible production malfunctions will make product quality issues a thing of the past. Ever-learning and evolutionary AI systems enable us to identify the smallest deviations in production in real-time, facilitates maximum flexibility in production and reduces downtime. Machines will even last longer as downtime for maintenance can be scheduled at the right moment. AI has already become the technology that improves quality, maintenance and management of supply chains, identifying trends and patterns with real-time data. Imagine machines driven by algorithms that analyze trends in society, politics, weather, consumption and more to adjust products in real time! This will enable the full transformation of the industry.

## AI Goes Beyond the Four Walls

The future of AI in manufacturing lies in collaboration instead of limitation. The real power and advantage of AI goes beyond the four walls of manufacturing to enhance the network of machines and services that deliver the products. The future power of manufactory lies in the usage of AI within the ecosystems of manufacturing. The success of manufacturing is driven by the collaboration across the whole ecosystem. AI will facilitate the shift from a sequential system to an open and interconnected supply hub. AI integrates the data beyond the walls of the factory coming from physical assets, digital networks and human behavior. Combined, this leads to better positioning in the competitive future of Industry 4.0.

## AI Augments Manufacturing

The past years a lot of hype and buzzwords surrounded AI in manufacturing. A realistic approach of expectations of the possibilities is needed. AI in manufacturing knows many failures, involves risks, and still needs high investments. Nowadays, AI has become more trusted and widely available. This is very important because manufacturers that are able to invest in AI will have a huge competitive advantage in the near future. It is important to make AI available for any industry by lowering the risks and initial investments. Artificial intelligence becomes the nerve system of any modern and future oriented factory; a future where algorithms automate the manufacturing process from end-to-end: managing machines and robots and anticipating the world via digital twins.

Still, the future success of AI in manufacturing will prove that humans are just as important. AI will effectively automate many tasks but will also enable engineers to do the more complex and higher-value tasks that will still exist. The future of AI and manufacturing lies in a frictionless cooperation between engineers and factory workers with smart machines.

## Real-Life Cases

### Trailblazers in the World of AI in Manufacturing

A lot is happening in the field of AI start-ups in Manufacturing. Many examples of AI start-ups show the promising and transformational power of human creativity together with smart machines. All start-ups mentioned have no business relation with Cognizant and are inspirational.

#### Covariant

Covariant envisions a universal AI that allows robots to see, reason and act based on the world around them. The company introduced the Covariant AI Brain for industries to enable a more diverse usage of future robotics.

[covariant.ai](http://covariant.ai)

#### Oqton

This start-up connects intelligent manufacturing software with manufacturing hardware. The platform enables automated workflows with, for example, tracking, traceability, CAM and IoT. Oqton also has an AI-powered platform for additive manufacturing.

[oqton.com](http://oqton.com)

#### Instrumental

This start-up delivers AI-powered proactive defect discovery, end-to-end failure analysis tools, and remote real-time build monitoring via a cloud platform.

[instrumental.com](http://instrumental.com)

“75 million jobs will be displaced by artificial intelligence, robotics, and automation. 133 million new jobs may be created.”

WEF, 2018

# Enabling the Marketplace With Hyper-Personalization

Traditionally, manufacturers have consisted of separated silos with each department gathering and storing its own data, without sharing it with any other department. This way of working is inefficient when faced with the outstanding efficiency and productivity offered by digital solutions including hyper-personalization, automation, and AI.

As manufacturers look for ways to increase their revenue and decrease their costs, they are increasingly finding that digitalization is the answer. This has led many to start to transform their operations, starting with the integration of resources across the organization.

So, what challenges are the manufacturing industry facing? How can digitalization, hyper-personalization and AI help? And what impact does this have on the marketplace?

## Operational Challenges

As manufacturers push to become more efficient, the efforts of managers are being measured against KPIs that look at the agility of their organizations and the optimization of its processes. This is driving the transformation of manufacturers from the traditional silo approach towards an integrated and digitalized organization.

When it comes to digitalization within the Benelux, manufacturers face three main types of challenges from an operational standpoint: customer-specific challenges, process concerns and IT and infrastructure issues.

## Customer-Specific Challenges

Embedding customer needs in a manufacturer's strategy can significantly improve decision making for both future organizational productivity and customer experience. Unfortunately, very few manufacturers in the Benelux have successfully achieved this. Furthermore, as the COVID-19 pandemic has increasingly driven customer interactions online, the lack of customer-centricity has become increasingly visible as organizations often seem to be uncertain as to who their actual end-customers are.

## Process Concerns

Digital initiatives and processes implemented by manufacturers are often undertaken in isolation in a specific division or

department without considering the possibility of harmonizing or integrating the initiative or process in the entire organization, which reduces the organization's ability to be agile as the business situation changes. Furthermore, manufacturers often have a high level of administrative transactions, especially in the back office, which can be automated to increase efficiency and free up internal resources.

## IT and Infrastructure Issues

Even though many organizations are looking how to digitalize, the digital maturity level of many manufacturers in the Benelux is low. This is often due to the entrenched silos found in many organizations and the uncertainty of top managers about how to start the integration and digital transformation.

A further complication is due to the fragmentation of existing legacy systems, as well as those inherited after a merger or acquisition. The data contained in all these systems needs to be evaluated to ensure that it is correct and usable before being connected so the data is accessible and transparent throughout the entire organization.

“Correct and connected data is essential for manufacturers that want to achieve the next level of digital maturity.”

## The Digital Transformation

Digital transformation is increasingly a top priority for manufacturers in the Benelux. However, for manufacturers to achieve the next level of digital maturity and integrate processes across the organization, management will need to use their view of the entire organization to implement a top-down approach to remove all internal silos, including those that surround individual production sites.

The drivers for digital transformation include challenges like competition from a new brand in the market, the desire to expand



“Successfully moving from B2B to B2B2C optimizes and expands the customer lifecycle value and improves customer experience.”

into a new target market, or disruptions such as competitors significantly changing their business model or delivery terms. In these situations, a digital transformation is the only way that the manufacturer can continue to compete.

In addition to the need for a top-down approach, there are several other questions that need to be answered for a successful digital transformation.

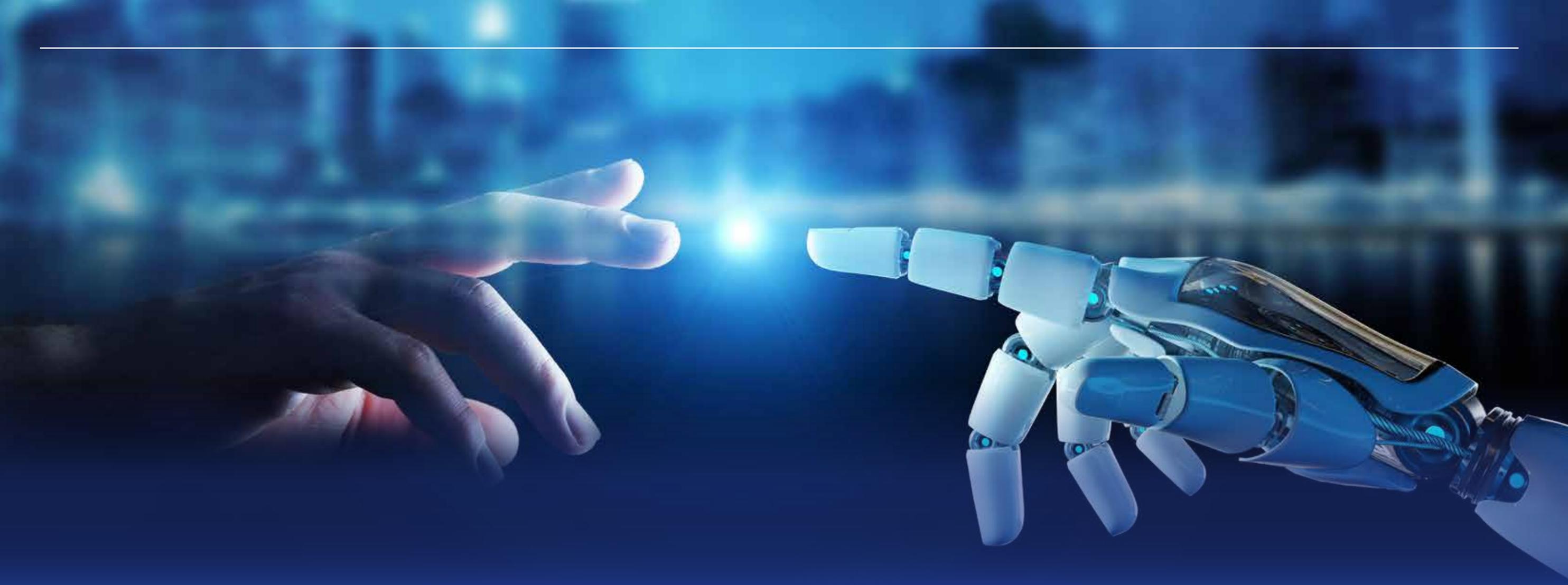
## One Integrated Organization or Two?

Some organizations have already started their digital transformation towards Industry 4.0. However, these manufacturers frequently split the organization in two by implementing separate systems for the sales and marketing departments on one hand and for the manufacturing processes and supply chain on the other. To realize the full potential of digitalization, organizations need to integrate all departments and processes into a single system that encompasses the entire organization.

## Who Owns your Data?

Within a traditional manufacturing organization, data is gathered, stored, and used by different departments, all working in isolated silos. As employees are unable to access the data from the entire organization, it is challenging for them to deliver a good, consistent customer experience.

This issue grows exponentially as the organization undergoes a digital transformation. The number of data sources and amount of data increases significantly because of the proliferation of IoT devices, new connections from legacy sources, and data gathered by different departments. Instead of each department being responsible for their own data, organizations need to identify one person or team to 'own' all data within the entire organization. While this initially falls under the responsibility of the Chief Information Officer, as the organization's digital maturity grows, ownership is often transferred to the newly created role of Chief Data Officer.



### Personalization in a B2B2C Context

Manufacturers operate in a B2B environment, delivering goods that are used by other manufacturers or sold by retailers further down the supply chain, which makes it difficult to fully understand the end-customer of their products. This issue becomes more challenging when you consider the complexity of today's supply chain where no single company owns or controls every aspect.

As mentioned before, as the COVID-19 pandemic has increasingly driven customer interactions online, the lack of customer-centricity has become increasingly visible as organizations often seem to be uncertain as to who their actual end-customers are. Hyper-personalization empowers manufacturers to move from a B2B to a B2B2C perspective, offering clear benefits.

### Hyper-personalization in Sales and Marketing

When it comes to sales and marketing, hyper-personalization can help manufacturers in three ways. Firstly, it optimizes the customer lifecycle value. Manufacturers need to have clear insights into what their customers want and desire, even if they don't have direct connections through the market. This requires shifting from broadcasting marketing messages into a dialogue with the end-customers to uncover what they expect.

Secondly, hyper-personalization improves the customer experience. A satisfied customer is more likely to remain a customer, making every customer interaction important. One of the many options available here is to utilize AI in customer calls and give call agents guidance based on the intonation and emotions displayed by the customer.

Lastly, it expands the customer lifecycle from occasional customer through loyal purchaser to brand advocate. This requires bringing together customer lifetime value challenges, customer experience, and customer lifecycle challenges to achieve a successful outcome.

### Hyper-Personalization in Production and the Supply Chain

Hyper-personalization can also make a difference for production and in the supply chain. To give a few examples, an organization can utilize data to optimize their capital investments to maximize productivity. Data can also be used in a digital twin (virtual representation of a product or factory plant) to model potential upgrades to manufacturing processes before they are put into production.

Additionally, combining an integrated digital solution with the data gathered to give a B2B2C perspective can assist manufacturers to predict and coordinate what their customers need and when they need it, which enables production optimization.

### Hyper-Personalization as a Business Model

Manufacturers can use the data gathered by their digitalization strategies to adapt their business model. Instead of purely working within their organization, manufacturers can now share data and collaborate with other organizations in their ecosystem or supply chain, opening up new opportunities.

Hyper-personalization can further transform a manufacturer's business model by selling the data they capture to other parties. For example, a car's onboard computer captures information about the frequency and lengths of journeys, driving styles, preferred travel times, and more. This data is useful for city planners, car dealerships, public transport officials, environmental activists, public safety lobbyists, and many others.

### Taking the Next Steps with Hyper-Personalization

As we have seen, when implementing a hyper-personalization strategy, manufacturers need to start at the top of their organization. Only when the C-suite fully understands and recognizes the strategic importance of data and the advantages of having accurate and connected data, can the organization benefit from increased efficiency, lower costs, and increased revenue. Is your organization ready to benefit from hyper-personalization?

“Hyper-personalization can transform a manufacturer's business model and open up new opportunities.”



**“Technology**  
changes  
**all the time;**  
human nature,  
**hardly ever.”**

*Evgeny Morozov*

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## Key Take-Aways

1. Put customers in control of their own data, and enable them to utilize it their way.
2. Focus on creating/sharing borderless data with consumers and suppliers.
3. Prepare for “beyond four walls” execution and manufacturing.
4. Move from assembly line to assembly ecosystem.
5. Embrace the circular mindset and ways of manufacturing.
6. Prepare for a digital, AI-first world of manufacturing.
7. Do not overestimate technological promises. Never underestimate the much-needed human skills in the manufacturing process.
8. Do not underestimate the new future skill sets of your workforce. Prepare them for the new digital future.
9. Do not try to be innovative alone. Combine forces with business partners to gain speed, innovation power and enhance financial possibilities.
10. Try to disrupt your own processes. If not, someone will do it for you.

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