Look Out 2020+
Industry Trends
Discrete Manufacturing

Accelerating the shift to personalized services

Thought Leadership Atos

Megatrends in Discrete Manufacturing: Accelerating the shift to personalized services

"B2Me is a vital driving force for change, impacting the entire Discrete Manufacturing value chain. Only those who adjust to address the needs of the B2Me world will succeed."

Thilo Stieber
Group VP, Global Head of Discrete Manufacturing,
Chief Digital Officer Manufacturing, Retail & Transport, Atos

Today's complex discrete manufacturing industry is looking to the new digital world to optimize fast-changing global supply chains and plants' operations. Meanwhile, deep transformation trends taking shape under the surface are driving a wealth of disruptive changes that are set to emerge in the coming decades.

Innovation picking up speed
Innovation is accelerating across the entire industry, bringing in disruptive advances in how products and services are designed, made and used. These innovations are being driven primarily by growing consumer expectations with their demands for higher personalization, faster delivery and improved service levels. Growing product and service complexity increases support and maintenance requirements.

Industry 4.0 strategies are streamlining global value chains, which are facing an increasingly volatile world with risks around exchange rates, customs charges and threats coming from war and political uncertainty such as Brexit. Added to these are volatile raw material prices and stricter regulations around data and mitigating climate change.
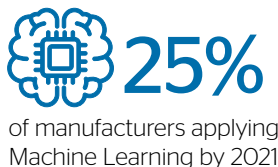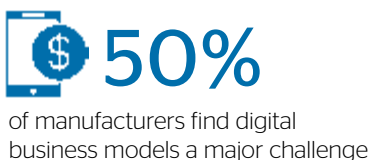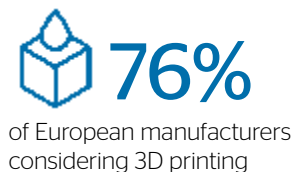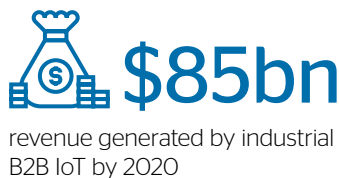
Toward a service-driven industry
Connected technologies are providing intelligent ecosystems of smart products and services. Today's traditional business model is changing fundamentally toward a model based on usage rather than ownership. For instance, companies charge for the number of screws placed rather than for the screwdriver; or for the amount of air used rather than the compressor. And maybe one day even for the amount of energy saved rather than for the amount of air used.

Breakthroughs in Artificial Intelligence (AI), the Internet of Things (IoT), Edge Computing and High-Performance Computing (HPC) are making even smarter products and services visible on the horizon, while 3D printing means products may soon be printed in-store or even at home.

The ultimate move toward smart product services will require partnerships with adjacent industries. Incumbents require agility to adapt to changing demands and shifting ecosystems. They must fundamentally reinvent their technology, value proposition and business strategies.

Today's evolutions represent immense opportunities for manufacturers to leverage digital and move to new business models in platform-based ecosystems.

$85bn
revenue generated by industrial B2B IoT by 2020

76%
of European manufacturers considering 3D printing

90%
of manufacturers challenged by unplanned disruption

50%
of manufacturers find digital business models a major challenge

25%
of manufacturers applying Machine Learning by 2021

4%
regard their industrial equipment maintenance very efficient

50%
of manufacturers' revenues from services by 2020

45%
of activities people perform could be automated

47%
aim to build new industrial value networks & digital ecosystems

Sources: various industy analysts

Four transformational challenges and opportunities for the future of Discrete Manufacturing

1

B2Me – toward mass personalization

Consumers' expectations are changing; they want diversity, personalization and usage-based 'pay-as-you' and 'pay-how-you' business models based on outcomes and usage rather than ownership. Empowered consumers are also expecting simplicity and more for less, easily switching to companies that offer the best services and experiences.

Manufacturers must transform from mass-production to mass-personalization to address the needs of the B2Me world. The shift from a product-centric to a customer-centric approach requires them to adjust their entire value chain, from design to make to use. A micro plant approach could bring them closer to the consumer so they can deliver personalization within a short response time. Collaboration with stakeholders in adjacent industries will further increase the end-to-end customer experience.

As consumers turn to their digital peers for advice, manufacturers must account for their customer's customers in their strategic and operational manufacturing approach. B2B customers will soon bring similar demands to B2C consumers.

Digital can help companies become more agile and rapidly fulfill evolving demands. The move to B2Me is also an opportunity to implement multi-channel B2C services and strengthen relationships with consumers.

> The potential impact is immense; keep close to consumers, increase agility and deliver quickly.

2

Develop end-to-end digital capabilities

To react to fast-changing market and consumer demands, manufacturers must reduce time-to-market while delivering highly personalized products and services cost-efficiently. The Digital Factory will allow them to streamline existing processes, from design to make to use.

Moving to Digital Twin will be essential, allowing manufacturers to close the loop between R&D and the consumer. Meanwhile, Industrial IoT (IIoT) technologies boost benefits of existing PLM, MES and ERP systems, and advanced analytics and AI help with producing parts more efficiently and delivering high-quality products in the right quantity to customers worldwide. New digital competencies are required, some obtained from the wider ecosystem.

Fast and secured connectivity and automation allows manufacturers to optimize global supply chains and manufacturing processes. The supply chain is also transforming toward highly dynamic value chains that can collaborate globally and in a more agile way.

Will the huge plants optimized for mass production no longer be required? Will micro plants optimized for mass personalization become the norm?

> The potential benefits are huge: cost pressures managed and sustained higher profitability, along with increased competitiveness through meeting customer expectations.

3

Rethinking business models

The fundamental shift from selling products toward selling product-related services is bringing a change toward usage and outcome-based business models. Creating open platforms and marketplaces and leveraging smart products and services will be essential to opening up new opportunities. Knowledge networks, for instance, will be key to delivering unique products that exist only in the mind of their inventor.

To thrive, discrete manufacturers need to focus on delivering personalization and developing value-added services that enhance the overall experience. This requires customer-driven manufacturing that puts consumers at the center of business models. Manufacturers should explore how they can monetize their increasing volumes of data. They may additionally monetize their deep expertise and selling digitized knowledge in the form of algorithms.

Digital technologies are impacting and transforming the entire manufacturing value chain, from product innovation to sales and services. Data analytics and IoT allow closer collaboration and integration between customers and suppliers while connecting the top floor with the shop floor.

> Personal PAYX services are signposts of this trend. Data and networks may together radically transform discrete manufacturing business ecosystems and open new revenue streams.

4

Putting security & compliance at the core

As digitalization becomes the norm throughout the entire industry – from how the product is designed and built to how it is used – discrete manufacturers must ensure the absolute security of the products and the increasing volumes of data they produce and share. Protection against unauthorized access to not only data centers and networks but also products, plants and platforms is also now critical. The secure and unsecure approach is now obsolete; companies should follow the zero-trust concept, where nothing is safe by default.

Companies must protect their systems from fraudsters, hacktivists, mafia and hostile organizations and states, not only for IP protection and system availability but also for customer data confidentiality. They must ensure their security strategy contributes to continual and transparent compliance with regulations, especially concerning sustainability and control over consumers' data.

To succeed, players must deploy security, privacy and data protection principles and mechanisms deep into their ecosystem. A consistent end-to-end cybersecurity approach based on industrialized solutions and services is needed to handle increasing security challenges with the convergence of IT, OT and IoT. Good knowledge management is also essential.

> Businesses must put native security and compliance at the heart of their strategies. The reward: trust becomes a differentiator.

Building next-generation platforms to succeed in next-generation discrete manufacturing ecosystems

"Platform-centric business models are the next big thing for discrete manufacturers as they further extend their position in the value chain by becoming a central orchestration hub for value-added services in their ecosystem."

Stefan Unterhuber
Senior Director Digital Transformation, Global Manufacturing, Retail & Transport, Atos

Discrete Manufacturing is on the verge of **fundamental change**. The moderately digitalized industry is already deriving significant benefit from advanced prototyping enabled by Digital Twin and predictive maintenance enabled by IoT, AI, advanced analytics and edge computing.

Adopting a consumer-centric approach
With the wealth of new opportunities offered by **Industry 4.0, connected products, usage-based 'pay-as-you' and 'pay-how-you' business models** and more, the market is accelerating its journey into the digital world. But the market entry of non-traditional competitors means players must leverage platform-based business models to evolve from a predominantly product- to a consumer-centric approach.

Preparing for collaboration
The need for improving consumer experience and efficiency in the face of ever-increasing competition from new market entrants from adjacent sectors makes rapid transformation critical today. Preparing for the future requires a quantum leap in ensuring **agile industry processes and supply chains** along with the development of **collaborative ecosystems**.
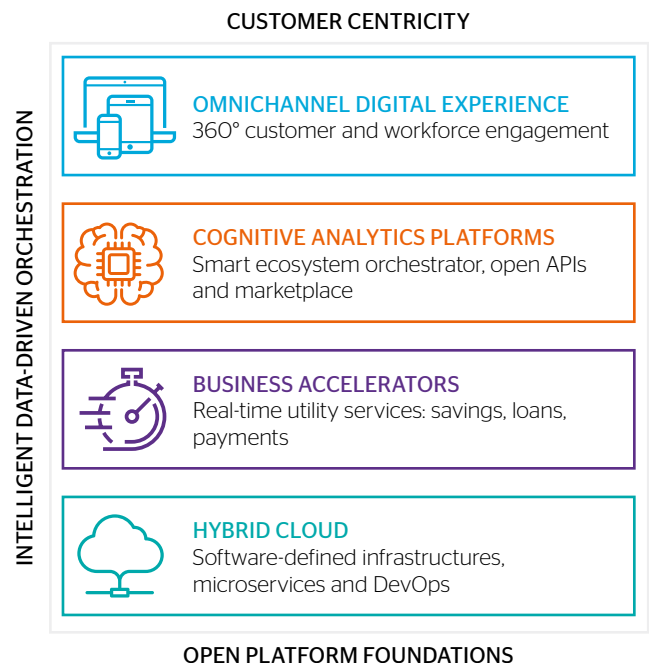
To embrace the challenges of a digital world, players in discrete manufacturing should:

- Adopt **open platform foundations** and real-time process automation to deliver the best products and services at the lowest cost, all while being ready to adapt to market changes.

- Become wholly **customer-centric** rather than purely product-centric, enabling an advanced consumer experience.

- **Provide intelligent data-driven orchestration**, being able to adapt to market changes and evolving customer demands in a real-time, prescriptive way.
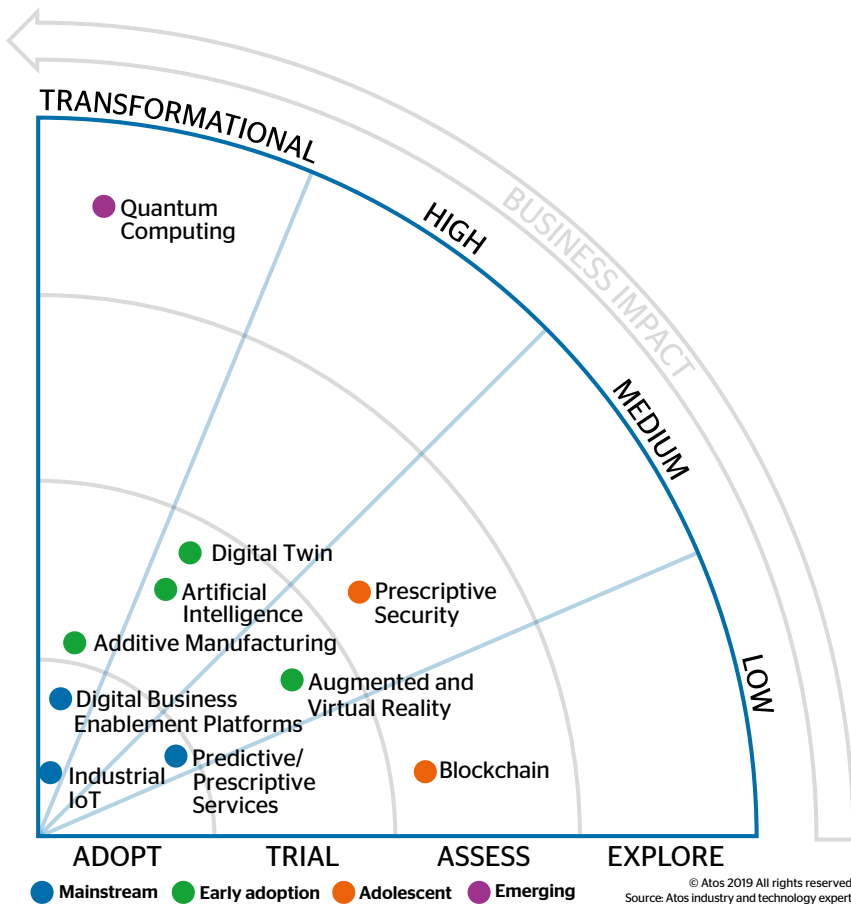
The road ahead
To thrive, discrete manufacturers will also need to create the right partnership and convene the largest ecosystem to enhance their value chain by enriching their offering and services. Players should begin transitioning to a new data-driven information architecture today. Building decentralized organizations based on micro plants and fully embracing the latest IoT, edge, digital twin and AI technologies is only the start of the journey.

Next-generation architecture for future-ready discrete manufacturing companies

CUSTOMER CENTRICITY

INTELLIGENT DATA-DRIVEN ORCHESTRATION

OMNICHANNEL DIGITAL EXPERIENCE
360° customer and workforce engagement

COGNITIVE ANALYTICS PLATFORMS
Smart ecosystem orchestrator, open APIs and marketplace

BUSINESS ACCELERATORS
Real-time utility services: savings, loans, payments

HYBRID CLOUD
Software-defined infrastructures, microservices and DevOps

OPEN PLATFORM FOUNDATIONS

There is no 'one fits all' platform solution. Discrete manufacturers will focus on a 'platform of platforms' strategy to rapidly deploy new services and business-critical applications.

10 strategic technologies that will shape the future of Discrete Manufacturing

Radar chart with quadrant. Technologies plotted:
- Quantum Computing (Emerging)
- Digital Twin (Early adoption)
- Artificial Intelligence (Early adoption)
- Prescriptive Security (Adolescent)
- Additive Manufacturing (Early adoption)
- Augmented and Virtual Reality (Early adoption)
- Digital Business Enablement Platforms (Mainstream)
- Predictive/Prescriptive Services (Mainstream)
- Industrial IoT (Mainstream)
- Blockchain (Adolescent)

Axes: TRANSFORMATIONAL, HIGH, MEDIUM, LOW — BUSINESS IMPACT
Columns: ADOPT, TRIAL, ASSESS, EXPLORE

Legend:
- ● Mainstream
- ● Early adoption
- ● Adolescent
- ● Emerging

Discrete Manufacturing Look Out 2020+ radar: 10 key technologies set to impact discrete manufacturing companies over the next 5 years.

Want to know more? Examine the Look Out 2020+ Global Technology Radar for deeper insights into these 10 strategic technologies and many more **atos.net/lookout**

Industrial IoT (including edge) increases the amount of data coming from connected products and assets. In combination with robotics, advanced analytics and AI, it enables next-generation automation on the shop-floor. Manufacturers should also explore how it boosts the benefits of PLM, MES and ERP systems.

Digital Business Enablement Platforms allow data and services to be distributed across third parties. Discrete manufacturers should put these platforms at the heart of their digital strategy to attract ecosystems partners and create multi-sided marketplaces.

Predictive/Prescriptive Services analyze the streams of data coming from industrial assets and consumer products to identify when these might fail. Maintenance processes can then be optimized to reduce downtime. Manufacturers should explore for boosting productivity and customer experience.

Additive Manufacturing or '3D Printing' facilitates rapid prototyping and low-volume production. Beyond its current potential in new model design and testing acceleration, manufacturers must consider its broader adoption for small series manufacturing, delivering spare parts more quickly and product personalization.

Artificial Intelligence promises to second human cognitive capabilities with virtual assistants, chatbots, knowledge engineering and smart machines. It will impact customer experience, business models and operations along the entire value chain. Manufacturers must prepare for the business, human and legal impacts.

Digital Twin closes the loop between continuous quality control, process optimization and insight into how products are used and perform in the field. In combination with HPC and HI, they could enable digital testing and simulation to replace time-consuming and costly physical prototyping.

Augmented and Virtual Reality are blurring real and virtual worlds, allowing users to engage with digital services within the context of their current environment. Discrete manufacturers should explore potential use cases, allowing service technicians to work hands-free and accelerating time for repair for instance.

Blockchain is a potential game-changer for conducting business with parties without prior trust relationships. Beyond product identity management and history audit, it could ensure transparency, traceability and authenticity throughout the entire supply chain.

Prescriptive Security uses real-time dark web monitoring, AI and automation to detect potential threats and stop them before they strike. Applications range from cyber-protection to product safety, fraud management and compliance. Manufacturers should explore integrating it into their IT/OT/IoT Security Operation Centers and the products themselves.

Quantum Computing promises to break traditional combinatory analysis limitations, bringing advances in High-Performance Computing for product design and manufacturing. It will also elevate risk by potentially breaking current cryptographic standards. Manufacturers must start preparing for both quantum computing and quantum-safe cryptography.

A glimpse into the future of Discrete Manufacturing: Expert views on best practice for digital transformation

Thilo Stieber
Group VP, Global Head of Discrete Manufacturing,
Chief Digital Officer Manufacturing, Retail & Transport, Atos

Zeina Zakhour
Cybersecurity Chief Technology Officer Atos, Distinguished expert & member of the Atos Scientific Community

What could discrete manufacturing companies look like in five years?

Major changes are on the five-year horizon for discrete manufacturing. The industry is firstly moving from a product-centric to a service-centric model: from products to smart product services and from product ownership to pay-as-you-X models. So, we should expect the discrete manufacturing world will be very different in five years and even more so in ten years with the product no longer the critical differentiator.

Not only is the consumer experience becoming an amalgamation of product and service, but consumer expectations are changing too. Tomorrow's consumer will expect a very personalized product or, and for that to be delivered the same day, for updates to be available every day and for the option to cancel always to be open. The **evolution from B2B to B2C to B2Me** is already appearing on the horizon.

This is really about manufacturers getting closer to the consumer. As the production that is currently carried out in the plant is moved to another manufacturer, the store and eventually the home, **manufacturers must understand the B2Me** so they can fulfill consumer expectations.

Whether its bespoke glasses printed at home or personalized shampoo mixed at home, **getting close to the customer is key**. And it doesn't matter if the product or service doesn't currently exist. If you can define it digitally, you can make it.

Which driving forces will help them succeed?

In the new world where the consumer is driving the change and changes are fast, **the winners will be those closest to the customers, not only in engagement but also location**. Local micro plants will bring manufacturers close to the market demand so they can both deliver faster and see emerging changes.

As demands become not only more rapid but also more complex, we believe players will **move toward networked micro organizations**, ready to deliver the required agility and speed in combination with partners. Managers will become the enablers that ensure individual micro organizations work together, using defined interfaces to share their micro-services efficiently.

Companies will even **build services around the expertise** that will be critical in a **world of hyper-specialization**, where only a handful of experts around the globe have a deep knowledge required. Digitized expert knowledge could even be packaged and traded with competitors as algorithms, an algorithm that helps save two percent of energy, for instance.

The open organization can share microservices both internally and with external partners, vendors, universities, knowledge networks and more. After all, you can't do everything yourself in such a complex

> **Discrete manufacturers must secure the products and services along with the increasing volumes of data they produce and share.**

and high-speed world. The ability to **work together** will be a success factor in the new world. This is disruptive, with the journey starting in this direction within the next five years.

What should discrete manufacturers do today?

While mere survival in the new world requires discrete manufacturers to make significant changes, those changes bring new opportunities: evolve from selling products to selling smart services, develop new business models around novel partnerships and more. We are helping the large customers we work with to take the steps they need to digitize and serve their customers along their entire value chain with our Digital Transformation Factory:

- **First, digitize expertise**. Information must be able to flow freely, uninhibited by human beings to use services, to exchange information. We are helping them digitize their knowledge to avoid the aging population limiting their flexibility as baby boomers retire.
- **Second, adapt for the edge age**. With information spread throughout their diverse, distributed environments, we have developed innovative platforms and modular systems with them, along with operational models to orchestrate their complex ecosystems.
- **Third, drive analytics**. We are helping our customers leverage our Manufacturing AI solutions to extend the lifetime of their assets by driving plant analytics beyond the dashboard.
- **Fourth, build your knowledge network**. With offerings and products based on knowledge shared across networks, we are helping them build the right organization and deploy the right tools to leverage the potential of open ecosystems to enhance their value chains.
- **Fifth, work on software-defined product**s. Here also, we are among the pioneers with Atos Digital Twin for designing smart products, not only allowing personalization in the field but also continually providing updates to keep products secure.

To succeed, **security will be essential, deeply embedded from IT to OT to IoT, from design to service**. This is at the heart of our approach.
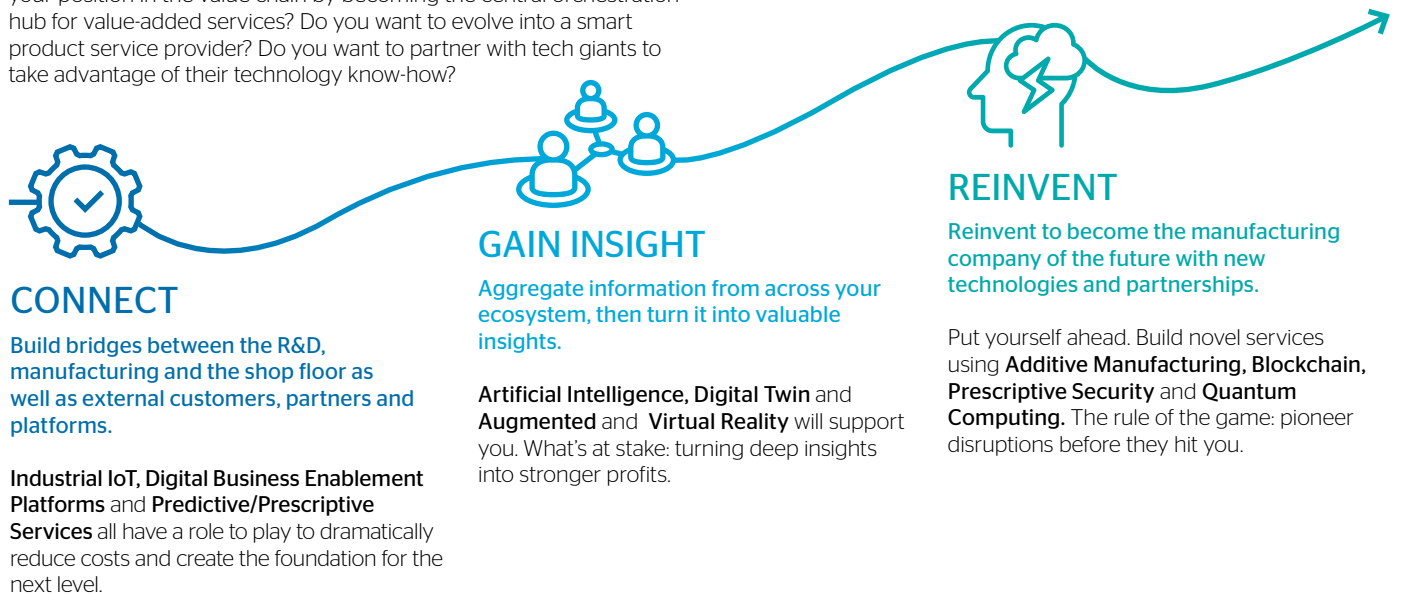
Tomorrow's discrete manufacturing future will be in AI, collaboration and digital twins. We are helping them, leveraging our expertise in digital, our industrial ecosystems and our strong alliances with technology partners as well as with manufacturing experts.

Creating your own manufacturing transformation journey

With all these changes converging at once, you must drive your discrete manufacturing company forward. Faced with a rapidly advancing technology and an evolving business ecosystem, the question you will be asking is not 'Why change?' but 'Which direction?' and 'How?'.

The first step is **figuring out your priorities and the role you want to play within next-generation ecosystems**. There are several possible positions, each with its pro and cons. Do you want to extend your position in the value chain by becoming the central orchestration hub for value-added services? Do you want to evolve into a smart product service provider? Do you want to partner with tech giants to take advantage of their technology know-how?

Having made that strategic choice, you must next **embark on a journey of progressive and continuous transformation** — combining people, organizational and technology streams. Your journey requires a roadmap. We have drawn up a three-step approach, with phases that can be undertaken simultaneously.

REINVENT

Reinvent to become the manufacturing company of the future with new technologies and partnerships.

Put yourself ahead. Build novel services using **Additive Manufacturing, Blockchain, Prescriptive Security** and **Quantum Computing.** The rule of the game: pioneer disruptions before they hit you.

GAIN INSIGHT

Aggregate information from across your ecosystem, then turn it into valuable insights.

Artificial Intelligence, Digital Twin and **Augmented** and **Virtual Reality** will support you. What's at stake: turning deep insights into stronger profits.

CONNECT

Build bridges between the R&D, manufacturing and the shop floor as well as external customers, partners and platforms.

Industrial IoT, Digital Business Enablement Platforms and **Predictive/Prescriptive Services** all have a role to play to dramatically reduce costs and create the foundation for the next level.

Throughout these phases, an open approach to innovation – such as the **Digital Business Continuum** approach developed by Atos, plus co-innovation with startups – will be paramount to success. In an ecosystem world where new players appear and spread at internet speed, openness is the best way to capture collective intelligence. As manufacturing companies strive to transform, open innovation labs, such as the joint Atos and Google Labs, will provide an ideal environment for bringing new ideas and new concepts to life – and creating connected product services for tomorrow.

Where should you begin?

As the Trusted Partner for your Digital Journey, Atos can help. Meet our experts and stay one step ahead by getting hands-on experience of new disruptive technologies.

ENGAGE in a co-innovation workshop at one of our Business Technology & Innovation Centers.

Get off to a quick start with a personalized workshop. Ask for a meeting:
> atos.net/btic

EXPLORE how innovative technologies can boost your own practice.

Leverage our experts and labs to build POCs tailored to your own business:
> Atos.net/discrete-manufacturing

STAY TUNED with the latest trends and best practices in digital transformation.

Keep yourself informed. Follow the latest insights from the field on:
> atos.net/blog

This is an extract from the full Atos Look Out 2020+ report, which provides an in-depth analysis of the emerging megatrends, business transformation opportunities and technologies that will drive innovation in the years ahead. Explore the full report on **atos.net/lookout.**

About Atos

Atos is a global leader in digital transformation with over 110,000 employees in 73 countries and annual revenue of over € 11 billion.

European number one in Cloud, Cybersecurity and High-Performance Computing, the Group provides end-to-end Orchestrated Hybrid Cloud, Big Data, Business Applications and Digital Workplace solutions. The group is the Worldwide Information Technology Partner for the Olympic & Paralympic Games and operates under the brands Atos, Atos Syntel, and Unify. Atos is a SE (Societas Europaea), listed on the CAC40 Paris stock index.

The purpose of Atos is to help design the future of the information technology space. Its expertise and services support the development of knowledge, education as well as multicultural and pluralistic approaches to research that contribute to scientific and technological excellence. Across the world, the group enables its customers, employees and collaborators, and members of societies at large to live, work and develop sustainably and confidently in the information technology space.

Find out more about us
atos.net/lookout
atos.net/discrete-manufacturing

Let's start a discussion together