

White paper

# Consumer-driven manufacturing

How to transform manufacturing from a  
product-centric to a consumer-driven approach

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teknology | PAC, March 2019

On behalf of

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**teknology** | PAC

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## FOCUSING ON CONSUMERS WILL BE KEY

Successful manufacturers will be those who have understood that it is key to fully align their products and services portfolio with ever faster-changing market needs and increasingly complex consumer and customer requirements.

Of course, increasing efficiency at all stages of the manufacturing value chain, optimizing cost structures, as well as producing and delivering products and services at certain quality levels will remain important in order to stay globally competitive. However, being able to respond appropriately and smoothly to fast-changing and increasingly complex customer requirements will be an ever greater challenge in the very near future and, more than ever, should be fully integrated into every manufacturer's strategy. So what are these fast-changing and increasingly complex customer requirements?

These requirements coming from consumers in the B2C business, for instance – the ultimate users of products – are already known all too well to manufacturers of consumer packaged goods or car manufacturers, for example:

- Consumers expect an increasing **personalization and individualization** of products and services.
- Consumers expect product and service **innovations** much quicker than a few years ago. In some industries (e.g. consumer electronics), technology develops so fast that products have expired by the time they are available in stores.
- Consumers expect **omni-channel availability**, which includes the availability of products in traditional stores and online as well as a seamless integration of all sales channels.
- Consumers expect a **faster product delivery time**, e.g. same-day delivery, and greater transparency of production and delivery processes, including track and tracing functionality.
- Consumers expect high levels of **service quality** at any customer touchpoint and in some markets have a high willingness to change provider if customer expectations are not being met.

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# 38%

**of manufacturing companies worldwide think that the need for higher agility and innovative power to address the rapidly changing market environment is more challenging compared to last year.**

Source: PAC CxO survey among manufacturing CxOs worldwide 2017, n=627

The more these expectations of consumers in the B2C business are met, the more this will subsequently also have a major impact on B2B customers in other manufacturing sub-sectors such as industrial equipment, mechanical engineering, or high-tech industries. This is because B2C consumers are ultimately also influencers or even decision-makers in enterprises, thereby making B2B customers increasingly just as demanding as consumers in the B2C segment.

However, what is even more important to understand, and this applies particularly to industrial manufacturing companies, is that it is not enough for manufacturers to merely understand the needs of their customers. In fact, they will have to include their customers' clients in their strategic and operational manufacturing approach in order to help their customers be successful in addressing the ever faster-changing demands of their consumers.

Considering the importance of being able to respond to fast-changing consumer demands, manufacturing CxOs, more than ever, will therefore have to ensure to follow an agile and flexible manufacturing approach. This will apply not only to manufacturers of consumer products, but in particular and increasingly also to manufacturers of industrial products.

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***Consumer-driven manufacturing is about anticipating needs of the ultimate users of a product or service and always being able to respond in a highly flexible, agile, yet cost-optimized manner!***

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Traditionally, manufacturers have focused on continuously improving operational efficiency by applying methodologies such as Lean and Six Sigma. However, often rigid production processes such as assembly line production remain a physical bottleneck in achieving supply chain agility. Transforming the manufacturers' value chain in order to enable agility, flexibility, and adaptability will therefore be key to transform towards a customer-focused manufacturing strategy.

The increasing amount and maturity of new digital technologies, such as IoT, analytics, AI, robotics, high-performance computing, augmented reality (AR), virtual reality (VR) etc., will enable this transformation towards a consumer-driven manufacturing approach in ways that have not been possible before.



# THE PATH TO CONSUMER-DRIVEN MANUFACTURING

## Digital transformation of value chains

In order to become more agile, flexible, and adaptable to fast-changing consumer and customer demands, manufacturing CxOs need to digitally transform their value chains by means of technologies.

This is the foundation for a consumer-driven manufacturing approach, which anticipates the needs of the ultimate users of a product such as faster innovations, higher individualization, faster delivery, or no downtime of equipment, thereby increasing the value-add for consumers.

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***New, digital technologies will enable a transformation towards Agile, flexible, and adaptable processes that help to increase the customer value in ways that have not been possible before!***

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## Collaboration in ecosystems

A consumer-driven manufacturing approach also requires collaboration in ecosystems. This is because partners in an ecosystem can enhance a manufacturer's own capabilities, thereby granting consumers and customers an even higher value-add.

## Customer-centric business models

Consumer-driven manufacturing, which is about anticipating the needs of the ultimate users of a product, also requires to rethink traditional business models. Focusing on consumers or customers leads to business models where customers will only be charged for products by usage, performance, or output, which ultimately increases the consumers' value-add.

Our proposed path for manufacturing CxOs to transform towards a consumer-driven manufacturing approach takes into account the fact that manufacturing companies may start at different levels of digital transformation maturity. And, at the

same time, different levels of digital transformation maturity may be required in order to transform towards a fully consumer-driven manufacturing approach.

Our approach also acknowledges that there are multiple ways of transforming towards a consumer-driven manufacturing approach and a variety of potential use cases, which may lead to different levels of value-add for consumers and customers. Some of them will have a lesser impact on a customer's value-add than others, but we believe that every step – be it small or large – is important on the path to a consumer-driven manufacturing approach, as long as it is heading in the right direction.

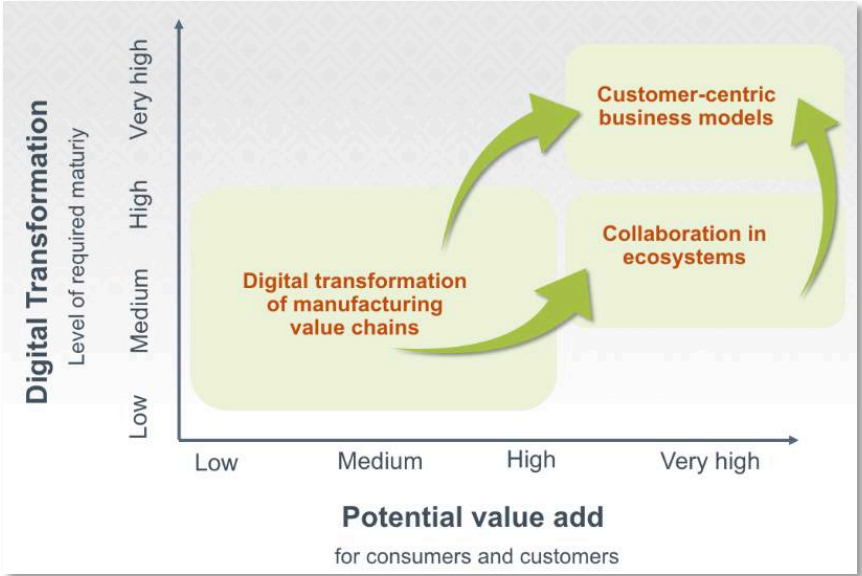


Figure 1: The path to a consumer-driven manufacturing approach



# HOW TO TRANSFORM TOWARDS CONSUMER-DRIVEN MANUFACTURING

## DIGITAL TRANSFORMATION OF VALUE CHAINS

A first step on the path towards a consumer-driven manufacturing approach is to digitally transform all relevant value chains in manufacturing in a way that enables increased agility and flexibility. This is important in order to build a sustainable foundation for a consumer-driven approach which embraces and anticipates the ongoing, fast-changing consumer demands and which enables an increased potential value-add for customers.

In the following, we will particularly describe those use cases and examples that support a digital transformation in some of the manufacturer's key value chains and will especially elaborate on the potential and requirements of each use case to deliver and increase the value-add for customers.

### R&D and Engineering

As consumers expect new product and service innovations much faster than before, consumers' value-add can be increased, for example, if new products can be delivered faster due to shorter R&D cycles or shorter improvement cycles.

This can be achieved, for example, by replacing time-consuming, costly physical prototyping with **digital testing and simulations** applied to virtual models of physical products, i.e. **digital twins**.

In addition, in order to be able to digitally test and simulate virtual models, this requires not only a relevant set of product-related data, but also appropriate design and engineering applications and, in particular, **high-performance computing**. Due to the increasing amount of data from connected products and assets – thanks to the increasing availability of **Industrial IoT platforms** and **secure connectivity solutions** – the need for appropriate high-performance computing capabilities will increase even more and greater volumes of data from connected products will be used for simulations.

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# 78%

**of manufacturing companies worldwide already have a company-wide digital transformation strategy for the entire enterprise or execute digital transformation projects in selected business areas.**

Source: PAC CxO survey among manufacturing CxOs worldwide 2017, n=386

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***The amount of data from smart and connected products will increase exponentially in the future. R&D and Engineering CxOs will be challenged to manage all this data and to generate meaningful, actionable insights in order to innovate faster.***

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In order to capture, store, and analyze this increasing amount of data from connected products in a way that generates meaningful and actionable insights, this will not only require a suitable infrastructure, but also appropriate **big data and advanced analytics capabilities** as well as **machine learning** and **artificial intelligence (AI) tools** to identify weak points in the design or planned configuration of products. In addition, **quantum computing** allows pharmaceutical companies to analyze and identify human disease patterns with the goal of developing new personalized drugs quicker, thereby making new medicines available to consumers faster.

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***Customers are quite reluctant to share performance-related data about their products, assets, or machines with manufacturing OEMs. Manufacturing CxOs will be challenged to develop a situation where customers see the value in sharing this data.***

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## Production

Consumers expect products and services to be produced and delivered faster than ever before. Manufacturers can increase the value-add for consumers if they are able to further reduce production cycles. This can be achieved, for example, through higher factory throughput, greater overall equipment efficiency, and more efficient worker solutions for the shop floor.

Use cases of how digital technologies can help to reduce production cycles include:

- **Asset location monitoring:** IoT enables location monitoring of production assets (e.g. tools, equipment, transportation vehicles) on the shop floor.
- **Automated replenishment:** IoT, analytic tools, AI as well as close integration with enterprise applications (e.g. ERP) and RPA will enable automatic replenishment processes for raw materials or product components by automatically triggering orders at suppliers.
- **Digital quality control:** IoT, analytics, AI, and machine learning enable automated, near real-time quality control during assembly or production



by means of sensors that capture data via images or video. This is analyzed using high computing power in order to lower the number of defective or misassembled products.

Production cycles can also be reduced if demand planning – ideally enriched with real-time insights from the demand side, namely the consumers – is better aligned with production planning. This will require a horizontal and **vertical integration of applications** from the shop floor with commercial applications such as ERP and CRM.

In order to deliver products faster, **cloud-based platforms** and **intelligent algorithms** can help to optimize fleet management and route planning. Combining different sources of data (e.g. data from trucks, traffic situation, weather data etc.) and analyzing them allows to generate recommendations on next best actions in real time (e.g. alternative routes for trucks) and to react remotely before problems (e.g. delivery delays) arise.

As customers also expect increasing levels of personalization and individualization of products, manufacturers that are able to use lot size one production will clearly also increase the value-add for customers.

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***Increasing expectations towards personalization and individualization will require production CxOs to rethink their manufacturing and supply chain strategy.***

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In order to meet increasing demands for personalization and individualization, existing production set-ups, such as the still widespread assembly line, will need to come under greater scrutiny, in favor of micro plants, for example, which are closer to the customers and leverage technologies such as **additive manufacturing**, which will particularly be a major enabler of lot size one production. Furthermore, **industrial IoT platforms** in combination with **robotics** and **artificial intelligence** will enable next-generation automation on the shop floor as well as the autonomous production of highly customized or individual products.

## Service and support

Consumers increasingly expect high levels of end-to-end customer experience around the usage of a product. Therefore, improving customer experience is key for manufacturers, particularly once a product is in use.

This is especially important in industrial B2B sectors, such as machine or equipment builders for plants or oil refineries, as well as other areas such as aerospace or heavy vehicle manufacturers. In these industries, it is particularly important to ensure product reliability. If neglected, this can cause not only financial but also health and safety risks. Financial risks include, for example, costs resulting from unplanned downtime of production equipment and higher costs for emergency service calls.

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***Sustaining high levels of customer experience can be a challenge when products are already in use at the customers. Service and Support CxOs that leverage the potential of new, digital technologies can reduce unplanned downtime and emergency maintenance significantly.***

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In order to avoid unplanned downtime of machinery or other heavy assets, predictive maintenance concepts will play a major role. The main enablers of such concepts include digital technologies such as IoT, predictive analytics, and AI. These use predictive algorithms to process data captured from connected machines or assets. The results can alert companies as to when their assets might fail and allow them to take appropriate measures, thereby avoiding unplanned downtime.

Another way of improving customer experience is to provide services and/or maintenance faster. Use cases on how to potentially reduce repair times in a B2B scenario include the following:

- Equipping service technicians with AR solutions that display maintenance instructions on smart devices such as smart glasses, so that they can work hands-free, thereby enabling faster repair times.
- Faster repair times are also achievable if expert service engineers can be consulted remotely, by leveraging IoT, AR, and mobile devices, rather than waiting for specialists to come on-site.
- Spare parts can be delivered on-site more quickly by leveraging decentralized additive manufacturing sites.

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# 90%

**of companies consider unplanned downtime and emergency maintenance caused by sudden failures as a major challenge**

Source: PAC Trend Study - Predictive Maintenance, 2018, n=232



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# 4%

**of companies consider their current maintenance processes for industrial equipment (...) within their internal operations as very efficient.**

Source: PAC Trend Study - Predictive Maintenance, 2018, n=232

## COLLABORATION IN ECOSYSTEMS

No manufacturer will be successful on its own in the future. In order to face ever faster-changing market conditions and increasingly complex customer demands, collaboration in ecosystems will be key to deliver a higher value-add to consumers and customers. Also, when manufacturers collaborate within ecosystems, the value-add for customers can come from various angles:

- Manufacturers that collaborate closely with their suppliers or engineering services partners can **increase the efficiency of their product development processes** and **shorten development cycles**, thereby reducing the time to market for new product developments or improvements.
- Manufacturers that work closely with their suppliers and logistics providers can achieve **shorter delivery times** for their customers for products or spare parts, by leveraging decentralized and flexible warehouse spaces that are closer to the customers, for example.
- Manufacturers that collaborate with stakeholders in adjacent industries can **increase the end-to-end customer experience**. A well-known and often-cited example relates to smart farming ecosystems, where manufacturers of agricultural vehicles collaborate with seed and fertilizer manufacturers as well as weather data providers to deliver recommendation services to farmers about the best time and place to sow seed and use fertilizers as well as the suggested amounts. Or, to mention the most common example of connected car ecosystems, where car manufacturers work together with connectivity providers, content providers, and public sector authorities (the latter to further develop autonomous driving concepts).

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***Manufacturing CxOs that collaborate in ecosystems will be more successful than those who do not!  
This is because the ecosystem enriches the manufacturer's own products and services portfolio and enhances its capabilities, thereby resulting in a higher value-add for consumers and customers.***

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Collaboration in ecosystems is nothing new and has been a key topic for many manufacturers for decades (e.g. in the automotive industry). Furthermore, in order to collaborate, it is not always necessary to replace and digitally transform existing B2B processes, for example, if they are enabled with solutions for the inter-company exchange of data and information (e.g. based on EDI) and are already seamless and integrated.

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# 47%

**of manufacturing companies worldwide consider it a major goal to establish new value networks and digital ecosystems as part of their digital transformation.**

Source: PAC CxO survey among manufacturing CxOs worldwide 2017, n=386



However, considering the ever faster-changing consumer and customer demands, this will also impact relations with stakeholders in the ecosystem, such as the need to get new partners on board more quickly. This will require, in particular, **scalable, cloud-based collaboration platforms** that enable faster and easier connectivity and **open APIs**. Such cloud-based innovation platforms or industry-specific marketplaces need to facilitate the seamless and **secure exchange of data** between different organizations through a shared reference architecture and common governance rules.

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***Sharing data in an ecosystem will be the fuel of collaboration, but will require appropriate data security and data governance concepts.***

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We also see growing evidence that sharing data in a broader ecosystem is increasingly viewed as important. Industry-related initiatives include the Industrial Data Space (IDS), founded in Germany, which aims at defining data standards and data governance frameworks to be used in collaborative data-sharing environments or Combient, which is a cross-industry collaboration network in the Nordics.

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***Collaboration in ecosystems is a strategic management decision that needs to be executed top-down. It requires a change in mindset as companies are often reluctant to collaborate with others too closely, tending to protect their own data and knowledge.***

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## CUSTOMER-CENTRIC BUSINESS MODELS

Pursuing a consumer-driven manufacturing approach also involves a shift towards more customer-oriented business models, where customers will only be charged for products by usage, performance, or output. Such “as-a-service” business models are based on data received from connected products, such as the time a product is used, the performance a product achieved, or the output a machine delivered.

The value-add for customers in an industrial B2B setting is quite high, as it is a huge benefit if they can avoid high upfront investments such as buying expensive production equipment (e.g. robots) and instead only pay for usage based on the runtime or number of products produced. The benefit for the customer is about shifting costs from CAPEX to OPEX.

Although offering products “as-a-service” delivers value for both the customers and OEMs (ongoing service revenue streams instead of one-time product sales payment), there are some important prerequisites to make these new business models work.

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***Customer-centric “as-a-service” business models require significant investments in digital technologies and process alignments. Nevertheless, manufacturing CxOs need to elaborate on their future role in this play as the risk of disruptive players stealing this market opportunity is high!***

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First of all, manufacturers need to have already made some significant investments in the digital transformation of related value chains. For example, manufacturing OEMs need to have the IT infrastructure in place (e.g. IoT platforms and analytics solutions) and integrated the related processes (e.g. spare parts logistics, field service planning) to be able to execute predictive maintenance concepts, for example, where product failures are either completely avoided or where maintenance tasks can be carried out at times when the customer is not operating the machine (e.g. at night, when it is predicted that maintenance is necessary any time soon). Only when this is done is an OEM in any position to offer products as-a-service. Only then can an OEM guarantee complete availability of its equipment, i.e. high service level agreements, as otherwise high claims for unplanned equipment downtime and product failure will be applied, which must be avoided by all means.

New customer-centric business models can be offered for products and services originating from the manufacturer’s own domain. This alone can deliver considerable value-add to customers. However, there is even higher potential to increase the value-add for customers if products are offered to them as-a-service and comprise products and solutions from a broader ecosystem, improving the end-to-end experience and thereby increasing the value for the customers even more.

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# 50%

**of manufacturing companies worldwide consider it a major challenge to create new digital business models and positioning**

Source: PAC CxO survey among manufacturing CxOs worldwide 2017, n=386



A transformation towards new customer-centric, “as-a-service” business models requires, in particular, **scalable and secure cloud-based platforms with open APIs** that not only enable fast and easy integration of new collaboration partners from ecosystems, but also integrate **automated payment functionality** to facilitate large-scale micropayments and payment services between consumers, customers, and all participating stakeholders, all while applying the **highest security standards** and ensuring **GDPR compliance**.

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***Manufacturing CxOs need to balance the opportunities and benefits arising from new customer-centric business models with the risks associated with them.***

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To make data-driven, customer-centric “as-a-service” business models work, it needs to be a win-win situation for both the manufacturer and the customers or consumers. For the latter, being offered data-driven “as-a-service” business models, such as service payments by usage, performance, or output, can be precisely this “win”, with customers not questioning whether to share relevant data with the OEM as it is simply necessary to deliver this service in that way.

However, it is more challenging for manufacturing OEMs to develop a “win” situation. On the one hand, having access to data from their products in the field enables OEMs to use this data to make their products better, thereby also securing their long-term competitive advantage. However, on the other hand, manufacturers have higher shares of working capital on their books and the associated risks, something which – particularly when faced with an ever faster-changing market environment – is not to be neglected.

## PAC'S CONCLUSION



Moving from a product-centric to a consumer-driven manufacturing approach requires manufacturers to follow a path that comprises three domains of action: the digital transformation of its own value chains in a way that enables agility, flexibility, and adaptability; closer collaborations in ecosystems; and the development of customer-centric business models.

Each domain of action may require different levels of digital transformation maturity and each of them might have different impacts on the consumers' potential value-add. However, we believe that every initiative – be it small or large – is an important step on the path to a consumer-driven manufacturing approach.

A consumer-driven manufacturing approach also requires manufacturers to have very good insights and a clear understanding of their targeted customer groups, as consumer and customer value-adds can differ quite significantly depending on the individual, company, industry, or region.

And, despite the need to adopt a consumer-driven manufacturing approach that embraces and anticipates ongoing, fast-changing consumer and customer demands, it is of course also important not to forget about ROIs.

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***Despite the need to transform towards a consumer-driven manufacturing approach, it will of course also remain important to further increase efficiency in all value chains to make sure to manufacture at optimum cost structures.***

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The more manufacturers shift from a product-centric to a consumer-driven manufacturing approach, the more this will make them service providers. This will require them to increase their expertise in enabling technologies such as IoT, analytics, AI etc. and to make sure to develop a whole new set of digital competencies accordingly.

Manufacturers that are not ready to start the transformation towards a consumer-driven manufacturing approach will very soon realize that they are falling behind their competitors, who have understood that consumer requirements will change ever faster and who have understood how to apply new digital technologies in order to respond to this in a highly flexible, agile, yet cost-optimized manner.

## ABOUT ATOS



With its roots in manufacturing and the Manufacturing, Retail & Transport sector representing its largest source of revenue (more than one third), Atos has a thorough understanding of the manufacturing industry and a long and broad track record.

The digital solutions and services that Atos provides to manufacturing customers can be divided into the three major domains that all manufacturers have in common: “Design”, “Make”, and “Service/Use” of products. What manufacturers also share is the continuous pressure to excel in all three domains and seek new ways to overcome the challenges as presented in this paper: faster innovation and time to market, customer-centric manufacturing, as well as improving and “digitalizing” the customer experience.

To support manufacturers in their digital transformation in each of these areas, Atos has a service and solution portfolio based on platforms, configurable off-the-shelf software, and customer-specific developments, all of which are implemented by specialists who have earned their stripes in the manufacturing sector. Atos is able to deliver these platforms and solutions end to end, due to the synergy between its various divisions, all of which play a vital role in the realization of our customers’ Industry 4.0 journey: Business Applications & Platform Solutions, Infrastructure & Data Management, and, last but not least, Big Data & Cyber Security.

In **Design**, Atos provides both the infrastructure as well as the platforms and solutions that enable R&D departments to design more efficiently, thereby shortening the time to market of products. The solutions and services for “Design” include, for example, Bull supercomputers to run product engineering and simulation applications as well as product lifecycle management solutions. In addition to these domain-specific solutions, Atos sees an increasing demand for IoT platforms to collect field data to feed back product usage and performance data to R&D. In some cases, this may also include the addition of a digital twin on top of an IoT platform, which allows for a much more intuitive interaction with collected product data.

In **Make**, Atos already has a track record of more than two decades in manufacturing execution systems to close the gap between shop floor and top floor, including the integration with PLM and ERP systems. In recent years, Atos has invested in developing Industry 4.0 and capabilities for the digital transformation of manufacturing environments through Industrial IoT platforms, advanced analytics, augmented and virtual reality, and additive manufacturing.

In **Service**, next to more traditional aftersales solutions such as CRM, typical Industry 4.0 solutions offered by Atos include: Consumer IoT platforms (e.g. connected car, connected home) and digital customer experience platforms. For industrial environments, several platforms have been developed to support Field Service and Maintenance, such as the Atos service-enhancing technologies suite of solutions (remote communication system for service and maintenance technicians), the Atos Codex Connectivity Platform (CCP: a Remote Service Platform for industrial machinery) and a “Digital Performance Twin” platform for remote performance monitoring of industrial assets.

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# ABOUT TEKNOLOGY GROUP



teknowlogy Group is the leading independent European research and consulting firm in the fields of digital transformation, software, and IT services. It brings together the expertise of four research and advisory firms, each with a strong history and local presence in the fragmented markets of Europe: [Ardour Consulting Group](#), [BARC \(Business Application Research Center\)](#), [CXP](#), and [PAC \(Pierre Audoin Consultants\)](#).

We are a content-based company with strong consulting DNA. We are the preferred partner for European user companies to define IT strategy, govern teams and projects, and de-risk technology choices that drive successful business transformation.

We have a second-to-none understanding of market trends and IT users' expectations. We help software vendors and IT services companies better shape, execute, and promote their own strategy in coherence with market needs and in anticipation of tomorrow's expectations.

Capitalizing on more than 40 years of experience, we operate out of seven countries with a network of 150 experts.

For more information, please visit [www.teknowlogy.com](http://www.teknowlogy.com) and follow us on [Twitter](#) or [LinkedIn](#).

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