

SMART MANUFACTURING

The Growing Need for Flexibility in 2021

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INTRODUCTION

The manufacturing industry around the world is in the midst of digital transformation. The landscape as a whole is changing due to emerging requirements and the resulting shift toward local production. ISG predicts seven major trends will shape the manufacturing industry in 2021. A discussion of these seven market trends is followed by a discussion of trends affecting the industrial, automotive and hi-tech manufacturing sectors.



The ability to maintain a more flexible production network and switch to reliable local suppliers will take priority over price efficiency.

- 1. COVID-19 accelerates digitization and local production:** The COVID-19 pandemic has caused considerable disruption to global production. The need for a global network, efficient logistics and distributed supply chains is not new, but it has been brought into sharp relief during the pandemic. The manufacturing industry is facing two new imperatives:
 - **Increased supply chain resiliency comes with increased flexibility:** Producers pay attention to gaps in their supply chain with regards to reliability, political stability, safety and possible impacts on disruption. The ability to maintain a more flexible production network and switch to reliable local suppliers will take priority over price efficiency. Companies will investigate remote production capabilities, a blockchain-based trusted network and new resilience strategies to reduce future disruption.
 - **Reshoring or locating activities closer to the customer:** Many producers have started to locate smaller and more digitized manufacturing entities closer to demand. Assemblies in regional centers will become the norm within the next three years. Refocused national economic politics, Brexit and looming tariff wars have all contributed to an acceleration of these activities. Modern local plants are intelligent, automated and more virtual, requiring far less manpower than traditional offshore factories.
- 2. Manufacturers shift focus from products to products-as-a-service:** Product lifecycles are becoming shorter and shorter as customer loyalty to physical products decreases. Competition is now moving from product features to value-added services, and manufacturers are constantly changing the way they work to optimize business efficiency. In the automotive industry, software-enabled service platforms are becoming the new ground for differentiation, replacing hardware-related factors such as engine power and precision-engineered door handles. Success in this realm requires more knowledge about customers, software-based services and the ability to innovate and respond quickly to changing customer preferences.



Intelligent factories are increasingly deploying intelligent networks.

3. **Data analytics is a key enabler likely to receive more investment in 2021:** Insights for product-as-a-service initiatives and orchestration of the production environment are key to improving the end-user experience and resilience in product development. Analytics are used in all manufacturing segments but at different stages. For industrial machine tool production, for example, the application of analytics still centers around operational control and predictive maintenance. In the automotive industry, analytics is actively driving strategic developments such as autonomous driving and software-driven service platforms. And the hi-tech sector, analytics are being used to improve scientific processes, such as chip development and testing.
4. **5G infrastructure is an investment opportunity with high growth potential:** Intelligent factories are increasingly deploying intelligent networks. A 5G or a Wi-Fi 6 network not only promises super-fast connections and more bandwidth than Wi-Fi and 4G-LTE but also better connectivity, low latency and support for thousands of devices in one location, all of which are attractive to manufacturing companies. Requirements include high volume data applications such as the connecting AR/VR applications that are deployed in logistics centers and material storage yards.
5. **Cloud-based analytics and interconnection trends impact security:** Manufacturers will need to revisit their entire security architecture based on two fundamental changes:
 - **Security solutions can monitor the entire production ecosystem:** A new generation of production control systems called cyber-physical systems is creating a more connected production environment and a heightened security risk. In the connected production environment, it is impossible to manage security on locked and controlled devices. Instead, security officers need to concentrate on solutions that can permanently monitor the entire network including the machinery for any anomalies, so they can take action before they cause harm. Actions to divert attacks involve fake device footprints, diversion from vital workflows, deception and redirection.
 - **IT and OT security capabilities are converging into a single monitoring environment:** This keeps data secure and identifies anomalies quickly. Security is extending out of the IT domain and reaching into many different domains, especially OT. Traditional IT applications and systems require significantly different protection than machinery in the production environment. It is still a challenge to implement effective security without disrupting a device or workflow in the production environment.



The challenges associated with CAPEX have been accelerated by the pandemic, leading to a radical reimagining of IT-as-a-service (IaaS).

6. **The case for times-and-material (T&M) pricing gets tougher:** Market development accelerated by the profound change in the automotive industry and COVID-19 is creating difficulties for traditional suppliers of smart product engineering and product design: Companies with qualified but expensive personnel find it more and more difficult to compete with the competition, especially from India. New price models include outcome-based design agreements and industrial DevOps with intellectual property sold via a utilization agreement.
7. **Manufacturers outsource more comprehensive B2B2C services:** The challenges associated with CAPEX have been accelerated by the pandemic, leading to a radical reimagining of IT-as-a-service (IaaS). Digital services will enjoy a better reception in 2021 than they did in the pre-COVID days. Manufacturers will consider bold ideas to take costs out and improve manufacturing flexibility. One of the main areas of focus for providers will be to buy out assets or data centers to own more of the supply chain themselves. IT-as-a-service and enterprise resource planning (ERP)-as-a-service are gaining traction in the manufacturing sector. Producers are looking for partners that can take over end-to-end ERP solutions and offer them back as a service.

Industrial Manufacturing – Catching up on IoT, Analytics and Virtualization

Machine tool suppliers will strive to resume growth in 2021 by reinforcing their portfolio for stable markets, such as power generation, and growth markets, such as the health industry. Growth also will be fuelled by a rising demand for intelligent machine tools based on analytics and artificial intelligence (AI).

To service these markets well, machine tool producers must smarten up their own production environments, most of which are lagging two-to-three years behind other manufacturing segments like automotive or hi-tech. Attention is highly focussed on insight-driven and more agile production. Machine tool producers will likely leverage the following two trends:

- **Data analytics will be deployed at full speed with connected cyber-physical systems:** Industrial machine tool producers will implement new kinds of cyber-physical control systems to capture all available sources for analytics, including IoT data. These new systems are connected to the internet and analytics clouds to accelerate insights relevant for an optimized production environment.



- **Machine tool manufacturers will catch up on virtualization:** Increased activity and investment is happening in the integration of computer-aided manufacturing (CAM) in machine tools. A smoother production of micro components and reduced time frames for design and testing have become drivers to enhance virtual manufacturing capabilities in this segment.

Automotive Production – Centralized Control and Connected Ecosystems

Tesla has shown automotive original equipment manufacturers (OEMs) the necessity of a centralized software approach to accelerate innovation. Because of this, the new entrant is in a stronger position than much bigger global OEMs when it comes to developing consistent innovation in critical areas, including autonomous driving and connected car services. OEMs are taking actions to catch up.

ISG has spotted five major trends that will shape automotive manufacturing for 2021:

- 1. Automotive OEMs rearrange their ecosystems for a more centralized approach:** One of the highest priorities will be to consolidate disparate software-driven monitoring units for components into an aggregated steering logic. This shift is rippling through the value chain and hurting tier one suppliers that often supply their own intelligent controlling platforms for single parts. Manufacturers and, in turn, leading tier one suppliers are putting component suppliers under increasing pressure. They will look to bring more intelligent development back in-house to keep critical knowledge there and to improve the utilization of their own qualified employees.
- 2. Digitization leads to a convergence of IT and engineering in automotive:** The future of automotive manufacturing includes alternative mobility, shared service models and connected and autonomous vehicles. All these areas are driven by advances in analytics, automation and computing. IT will become an integral part of product design and engineering, and data analytics is more prominently deployed in the automotive design, production and testing environments. Production engineering services, such as automation and integration of virtualized or additive manufacturing, are increasingly hard to separate from product engineering. There will be an increasing number of providers, which are actively developing smarter manufacturing and components leading to smarter products.



- 3. OEMs deploy and invest in analytics in strategic areas such as autonomous driving:** Leading OEMs are fully aware that strides in autonomous driving are critical to their business. They are actively investing in and exploring data analytics to close the gap on innovative products being sold to – and increasingly expected by – the consumer market. For manufacturers, it is critical to integrate as much Silicon-style innovation as possible as quickly as possible. Waymo, a commercial self-driving taxi service company that spun out of the Google autonomous driving project, sets an example for creating data-driven possibilities. Data democratization will be deployed to train machine learning models to reduce the likelihood of accidents in increasingly complex scenarios on the road.
- 4. Automotive products are sold as cars-as-a-service:** An increased number of product variants with shortened lifecycles is leading to even higher cost pressure. To deal with this, OEMs will need to transition from a vehicle- to digital service-centric approach and developing new digital platforms. Critical functionality includes updating in-car software and selling additional services over the air. This not only helps to optimize development costs but also enable new post-production revenue streams.
- 5. Digital complexity increases as the car becomes a data center:** Technology levers in the automotive sector – ranging from e-mobility to infotainment and the connectivity stack – are making strides in this segment and are creating new business opportunities for services. The value proposition of digital components integrated into vehicles is growing rapidly. As a result, revenue for the automotive segment will grow and diversify. At the same time, shared mobility solutions will increase the demand for software-driven services. Examples include chip tuning, security patches, infotainment features or the monitoring of mechanical capabilities such as the powertrain. A vital component of the new revenue model will be selling over-the-air feature-as-a-service or function-on-demand type applications from special infotainment requests to delivery services.



Hi-tech Manufacturing – Optimizing Chip Design

Four major trends will shape hi-tech manufacturing in 2021.

- 1. Manufacturers redefine processes to accommodate a higher complexity and cost:** With the rapid development of protocols, such as PCIe, DDRLP, NVMe, CXL for data centers, it will become increasingly difficult for semiconductor manufacturers to verify intellectual property (IP) every time. Engagements over hybrid storage IPs are gaining traction. Semiconductor manufacturers will need to reduce the time of verification and begin to deploy ready-made reusable and relevant IP to enable automation and speed up verification cycles.
- 2. The demand for external hardware testing and design services increases:** With the advent of electronic design automation (EDA) tools in the semiconductor ecosystem, the demand for seamlessly integrated verification and design IP has skyrocketed. As a result, the demand for reusable framework structures to scale the design and verification environment and accelerate the automation of verification processes is increasing.
- 3. Digitization significantly impacts the value chain for high-tech manufacturing:** Semiconductor manufacturers have started to outsource derivative designs to meet demand from various sectors. Accordingly, both foundries and silicon design houses are focusing on bringing derivatives to the market for their core semiconductor offerings. This requires changes to the algorithm to integrate various components into the final product more quickly.
- 4. The demand for edge-AI chips is fueled by the rise of edge computing:** Distributed computing will be implemented for applications including IoT and autonomous driving and fuels the demand for higher efficiency in commercially available edge-AI chips.

IT Suppliers Respond to their Clients' Challenges

Leading suppliers respond to trends by investing in innovation, development and automation. The IP portfolio they can build for methodology, software development and solution components will distinguish the ones that can stand up to competition in the market.



Consolidation is likely to happen with increased merger and acquisition activity in 2021. There are prominent examples of industry-wide consolidation driven by global, IT-centric service providers that are buying themselves into all key areas of manufacturing. Key examples include:

- Tech Mahindra taking a controlling stake in the automotive design icon Pininfarina in 2017 and the leading hi-tech chip designer Serium.
- HCL acquired the high-tech hardware specialist Sankalp in 2019 to enhance its position in the semiconductors and industrial IoT spaces.
- Arrow Electronics, took over eInfochips, one of the world's finest design and managed services companies in the chips segment in 2018.
- DXC acquiring Luxoft, the automotive software specialist with a leading position in digital cockpit designs, in 2019.
- Capgemini acquiring Altran, a market leader for automotive engineering services, in 2019.

ISG expects further consolidation in the domains of professional services supporting IT/OT and manufacturing engineering as well as product engineering.

The vision of a networked, smarter, demand-driven and flexible manufacturing environment was first brought up years ago. We called it Industry 4.0. Now, the pandemic has fueled the digital transformation necessary to turn those aspirations into reality. With uncertainties surrounding markets during COVID-19, manufacturers face difficult decisions and hardened competition. We already see that the manufacturing industries are passing on increasing responsibility for this transformation to integrated IT-OT and engineering service providers. Those who want to retain their market share will have to rise to this challenge.

ABOUT THE AUTHOR

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ISG (Information Services Group) (Nasdaq: [III](#)) is a leading global technology research and advisory firm. A trusted business partner to more than 700 clients, including more than 75 of the top 100 enterprises in the world, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 digital-ready professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data.

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