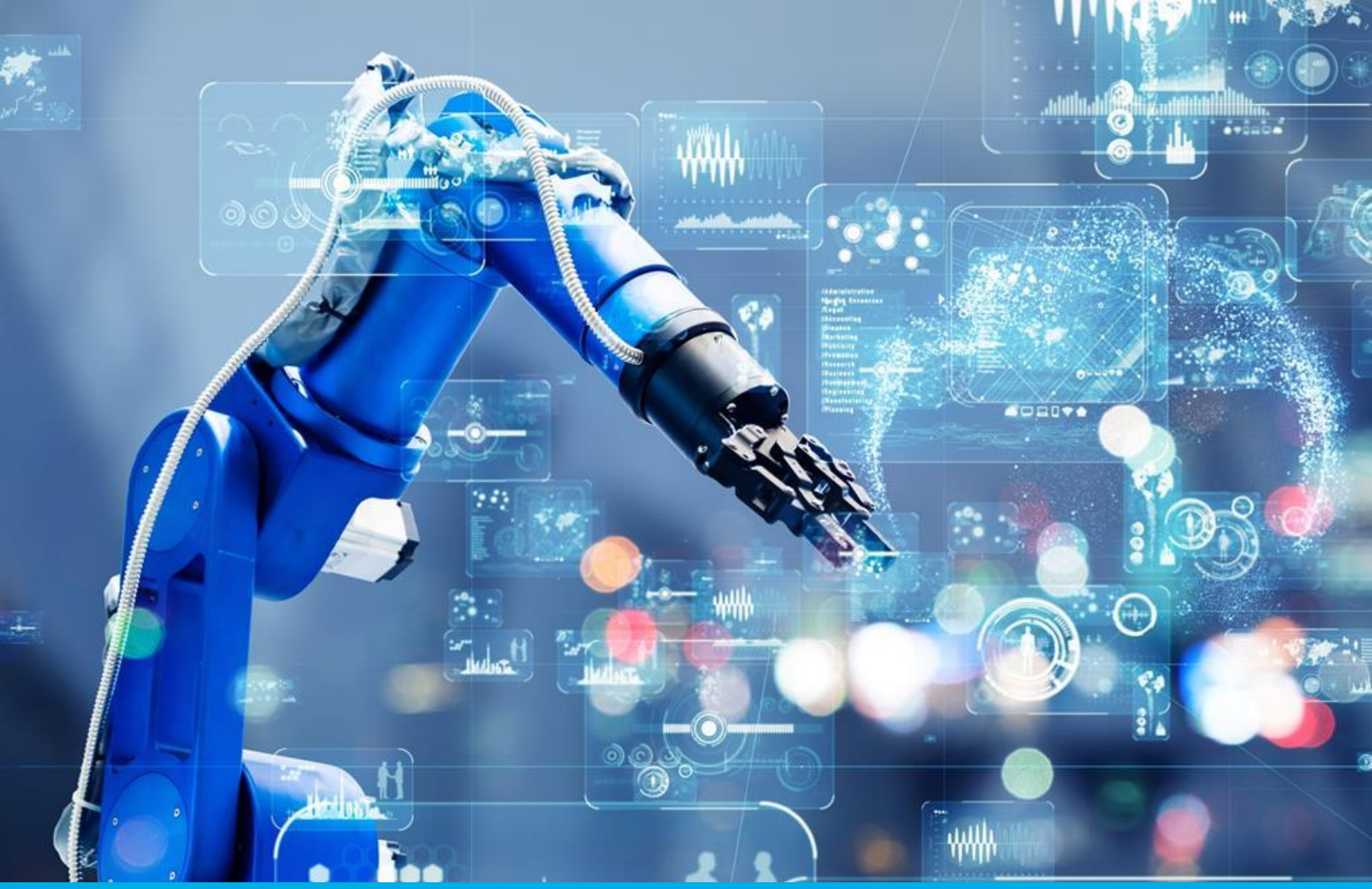
TOP 10

TOP 10 GROWTH OPPORTUNITIES IN THE INDUSTRIALS MARKET FOR 2021

– WHAT YOU NEED TO KNOW NOW

FROST & SULLIVAN



State of the Industry –
What You Need to Know Now

The world is facing unrelenting swings that are causing severe uncertainties, volatility and complexity. As organizations look to cut operational costs and preserve their bottom line, digital transformation has become a much sought after aspect to sustain performance.

The challenge lies in selecting the right tools that fit your business, understanding the real business value and implementing it with seamless integration to realize sustainable benefits.

Survivability of firms depends on the strategic pivots, one undertakes!

Every industrial company has the prowess to grow and pivot in 2021, by embracing ten value levers:

1. Circular asset performance model
2. Automation autonomy
3. Intelligent edge
4. Digital Enterprise realization
5. Smart lifecycle services
6. Circular Economy
7. Industrial supply chain rebound
8. Inline Manufacturing Process Optimization
9. Emerging Automotive Test
10. 5G rollout fuels Test demand

By adopting these pivotal levers, companies will be well-positioned to weather upcoming uncertainties, create unique differentiation and sustain top-line growth.

1

CIRCULAR ASSET PERFORMANCE MANAGEMENT MODEL

Zero-touch remote asset management capabilities to achieve end-to-end asset management

- Linear value-chains in asset management are becoming old school, as industrial customers march towards achieving a single version of truth of asset health on a single pane of glass. The pivot to a circular asset management model enables customers to pull in design, manufacturing test data and drive constant comparisons with real-time performance. This helps in optimal asset performance and production throughput.

What's Driving Growth?

- The rise in complexity of assets, with the decline in a skilled workforce
- The shift from route-based monitoring to online/in-line monitoring
- The emergence of multi-functional and affordable sensors

Recommendations & Best Practices

- Adoption of digital asset platform to integrate all asset and process data.
- Use of remote-collaboration technology by workforce to access data.
- Using data analytics to gather actionable insights.
- Striving for an integrated asset management tech stack.

2

AUTOMATION → AUTONOMY

45+ years of automation is being disrupted by autonomous technologies

- Automation helped in managing repetitive tasks and assisted in digitalizing manual work processes. The next step-up from here is self-orchestration with voice being at the center of disruption. We expect 'Jarvis' kind of digital assistants backed by master algorithms that stitch together the various functionalities of an organization.

What's Driving Growth?

- Mountains of data, molehills of insights
- Factories of future
- Sustainability focus
- Centralized workforce with de-centralized assets

Recommendations & Best Practices

- Assess your current state of business and identify the roadmap with realistic goals
- Benchmark against peers, to evaluate your pace of shift.
- General-purpose algorithms seldom work in industrial markets, but business problem-specific algorithms need to be developed/co-created.

3

INTELLIGENT EDGE DEVICES

Edge devices to empower legacy control systems

- There is a shift from centralized cloud computing to more decentralized edge computing. With 5G emerging to be a critical trend in the industrial landscape, edge computing will only emerge as its natural application. Cloud is, in essence, the backbone of digital transformation, but as enterprises begin to realize the benefits of the edge, there is an increased demand for edge capabilities in the technology architecture.

What's Driving Growth?

Edge Devices are used in:

- Mission-critical applications where there is a need for real-time insights.
- Remote sites where cloud connectivity is not stable.
- Applications where compliance and data residency are critical.
- To avoid transfer of large amounts of raw data between devices and the cloud to reduce bandwidth costs.

Recommendations & Best Practices

- Be judicious on where edge can be applied. Edge and cloud co-exist.
- Invest in microservices capabilities to drive orchestration and scalability of edge.

4

DIGITAL ENTERPRISE REALIZATION

Convergence of OT, IT, ET and UX drive digitalization of the enterprise

- Digital technology needs to move away from function-specific or site-specific implementation to cross value-chain to realize scalable benefits. Driving digital implementation across customer, plant, supply-chain, planning, scheduling, sustainability and services is the new mandate many organizations have taken up.
- Digital embracers will tend to fare better than laggards.

What's Driving Growth?

- Convergence of sensing, cloud, analytics and edge.
- C-suite involvement in business transformation
- Inevitable situation to transform, in order to stave-off disruption.

Recommendations & Best Practices

- Start small, think big, scale quick.
- Prioritize best digital opportunities and realize quick wins
- Involve people in order to drive material success across fleets of plants.
- Structure digital PMO's who are tasked with measuring ROI on all digital implementations.

* Operational Technology (OT), Information Technology (IT), Environmental technology (ET) and User experience (UX)

5

SMART LIFECYCLE SERVICES

Increasing demand for Managed Lifecycle Services driven by new-age service models

- Shift from product-centric to service-centric business model.
- Enterprises are exploring how to extend the lifecycle of a product and enhance a customer's experience with a product.
- Products/ solutions are packaged with services: Machines have sensors that provide automatic alerts when the product needs fixing; so the biggest changes to future business models will come from technology.

What's Driving Growth?

- Increased demand for data and analytics which provide insights and monitors product performance in real-time.
- Demand for tracking on how end-users are experiencing products opening further opportunities to develop new types of maintenance and operation solutions.

Recommendations & Best Practices

- It involves end-to-end connectivity to enable a variety of advanced data-capturing features, integrated into products.
- Huge volume of data will bring about a demand for data analytics that will aid the management of end-to-end product lifecycle.
- Managed lifecycle services will bring in new forms of interactive experiences for customers, starting with being able to share customized product requirements and ending with predictive maintenance of products and services

6

CIRCULAR ECONOMY

Increased focus on sustainability, green technologies and environmental challenges is driving the adoption of circular economy

40% - global water requirement increase by 2030

45 million tons of GHG emissions from energy use of water and wastewater systems in the US

40% - 60% of non-revenue water loss by water utilities

Top 5 risks identified in the Global Risks Report 2019/20 are Environment/Sustainability related

Digitalization Productivity Bonus, **will total between 6.3% and 9.8% of overall revenue by 2025**

The Future of the Resource Economy

- Sustainable Development Goals (SDGs) 2030 is influencing a shift in sourcing, distribution and usage/consumption of resources towards a sustainable and circular economy business model.
- New supply chain models with a proliferation of alternative sources and raw materials, resilience of assets to natural/physical hazards and preventive vs re-active maintenance.
- Digital technologies to provide infrastructure for more flexible, intelligent, connected & responsive systems.

7

INDUSTRIAL SUPPLY CHAIN'S CAUTIOUS REBOUND FROM COVID-19

After a brutal recession with several industries experiencing double digit negative growth, companies are charting growth strategies to leverage new opportunities in 2021

COVID Impact on Industrial Segment, 2020

Segment	Decline in 2020
Industrial Components	-18%
Equipment	-12%
Machine Tools	-22%
General Manufacturing	-12%

Trends to watch out for

- **Boom in eCommerce:** With COVID forcing end-users to stay home, we see a boom in eCommerce especially for industrial consumables. Fasteners, Seals, Gaskets, PPE, and even motors, hydraulics & pneumatics and small pumps seem to be most impacted by this trend.
- **Disruptions in Supply Chain:** Different regions had varying lockdown requirements and customers were forced to scramble for parts. Since then, there has been a steady push to diversify the supply chain and reduce supplier risk.
- **Increase in Subscription Services:** PPE and cleaning solutions are critical operation requirements in many industries and during the early days of COVID many companies had challenges acquiring them. As a result, there is now an increased focus on subscription services for consumables
- **COVID "Bubbles":** COVID isolated all economies. As countries and regions get back to normal, they are increasingly experimenting with a smaller set of economies rather than open up completely. This impacts movement of people and goods, and one more supply chain trend to watch out for in 2020/21

8

METROLOGY GOING IN-LINE

Increasing demand for full automation of manufacturing plants is gaining momentum and fueling inline inspection

1. Design validation
2. Full process visibility
3. Plant simulation/Digital twins of the entire factory
4. Machine parameter tuning

- Inline metrology is now integrated into the manufacturing process calling for inspections within the production cycle.
- The closed-loop production concept is gaining significance across all verticals to reduce cost-of-quality and improve productivity.
- There are increasing initiatives of leading companies implementing correlation-free measurement in automotive production lines using in-line measuring systems.
- OEMs are likely to invest 10% to 15% of their revenues in R&D to engineer in-line/near-line metrology products to address the needs of automotive end-users.

What's Driving Growth?

- COVID-19 and social distancing norms with the need to reduce dependency on personnel will drive more automated manufacturing processes involving inline and non-contact metrology.
- Increased demand for inspection rates and performance across materials with better and quicker data processing.
- Increased need to reduce time to market manufactured goods.

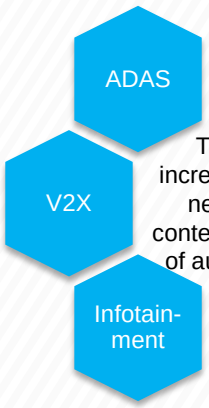
Call to Action

- Dimensional metrology solutions will need to have the ability to be integrated into multidisciplinary communication networks for supervisors to stay informed at any place/time.
- Development of emerging nanometer range sensor technologies, data processing, optics improvements, and advancements in data computation.
- Development and introduction of more sophisticated AI modules in defect detection to conduct data analysis and recommend updates to the machine tool parameters.

9

TESTING & SIMULATION DRIVING AUTONOMOUS CARS

The increasing level of vehicle autonomy and electrification mandates stringent testing procedures for drivability

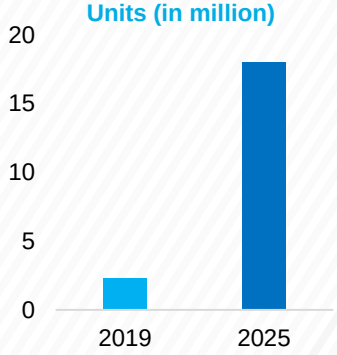


These 3 attributes increase ECU, DCU & network technology content in AVs as level of autonomy increase

Frost & Sullivan estimates that cars with L3 level of autonomy and above will represent 17% of global automotive sales by 2025, up from 1% in 2019. This will accelerate the demand for Hardware-in-Loop (HIL) test systems, Automotive Ethernet & 5G testing solutions in the next 5 years.

Superfast charging & longer range coverage are the key attributes targeted by EV manufacturers.
Systems and instruments that test different components of powertrain, battery technology & charging solutions will gain significance in the next 5 years.

Global Electric Vehicle Units (in million)



In the future, Vehicle-in-Loop testing will evolve from HIL to test powertrain & ADAS in unison to reduce cost.

What's Driving Growth?

- Increasing complexity of electronic systems in autonomous cars, including sensor fusion & increasing ECUs, will drive demand for innovative and cost-effective test solutions.
- Testing of high-capacity battery modules incorporated into the EV will call for high capacity power electronic systems.

Call to Action

- Connected vehicle: It is important for market participants to develop 5G compliant solutions as automotive OEMs will need to optimize networks for connected cars that work with 5G.
- End-to-end test system: Testing vendors that offer software capable of simulating the driving capacity of the entire vehicle than testing individual components will gain more prominence. So test vendors must focus on developing a portfolio of end-to-end test systems.

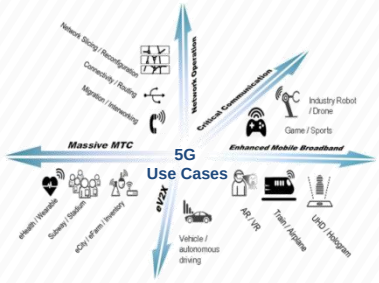
Key Companies

KEYSIGHT TECHNOLOGIES · ROHDE&SCHWARZ · spirent Promise. Assured. · YOKOGAWA · Anritsu envision:ensure

10

5G COMMERCIALISATION

Growth Opportunities



SOURCE: 3GPP

- Global network equipment manufacturers and network operators have substantially increased their R&D capabilities in the area of 5G testing.
- The development of connected vehicles, as well as Industrial IoT, are key areas of opportunity within 5G. To efficiently test 5G in the lab, digital twinning of 5G networks will gain prominence.
- As 5G continues its rollout globally, manufacturing activities of 5G compliant smart devices and small cell infrastructure will also increase. This will push demand for smaller and modular test equipment that can test 5G devices on an industrial scale.
- To accommodate 5G, there will be an increased requirement for the installation of dense, fiber optic cables, which will push demand for hand-held fiber optic testing equipment.

What's Driving Growth?

- The development of network slices will increase the degree of virtualization on 5G networks, pushing demand for solutions with enhanced NFV capabilities.
- Production test of 5G enabled smartphones, with millimeter wave spectrum, will spur demand for test equipment with enhanced capabilities.

Call to Action

- Communications test vendors should work on providing a complete test solution spanning the physical layer to the network layer.
- Test vendors should enhance their RF planning and active assurance testing capabilities, which will be used for 5G network planning before commercial rollout.

Key Companies

KEYSIGHT TECHNOLOGIES
ROHDE&SCHWARZ
Anritsu envision:ensure
NETSCOUT
EXFO
Spirent Promise. Assured.
infovista
VIAVI

SCHEDULE A COMPLIMENTARY DISCUSSION WITH OUR INDUSTRY EXPERTS

https://hub.frost.com/gsd/

Recommended Readings:

- ✓ Zeal for Productivity and Profit Pressures Accelerate the Growth of the Global Automation Lifecycle Services Market, 2019–2022
- ✓ Growth Opportunities in Biofuels, Removal of Micro-plastics, and Circular Economy
- ✓ Manufacturing Process Optimization Initiatives Powering the Global Dimensional Metrology Equipment Market, 2020–2024
- ✓ APAC Automation and Control Systems Market in the Upstream Oil and Gas Industry, Forecast to 2023
- ✓ Advancements in Communication Protocols Transforming Building Automation Systems

Is your organization prepared for the next profound wave of industry convergence, disruptive technologies, increasing competitive intensity, Mega Trends, breakthrough best practices, changing customer dynamics, and emerging economies?

Leverage visionary innovation that addresses the global challenges and related growth opportunities that will make or break today's market participants.

For more than 50 years, Frost & Sullivan has developed growth strategies for the Global 1000, emerging businesses, the public sector, and the investment community. Let us put our expertise to work for you!

SILICON VALLEY
3211 Scott Blvd
Santa Clara, CA 95054
Tel 650.475.4500
Fax 650.475.1571

TOKYO
Akasaka Park Building
5-2-20 Akasaka, Minato-Ku
Tokyo 107-6123 Japan
Tel: +81.0.3.4550.2210
Fax: +81.0.3.4550.2205

LONDON
Floor 3 - Building 5
Chiswick Business Park
566 Chiswick High Road
London W4 5YF
Tel +44 (0)20 8996 8500
Fax +44 (0)20 8994 1389

myfrost@frost.com
877.GoFrost (877.463.7678)
www.frost.com