

THE DIGITAL FORGE

Rise of Connected Manufacturing

Heralding a New Era

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The manufacturing industry is on the verge of a renaissance, powered by the uptake of the Internet of Things (IoT) and interconnected technologies.

In this article we explore how factories are transforming into smart facilities with the integration of Operational Technology (OT) environments, machine-to-machine communication and real-time data processing is establishing standards for effectiveness, productivity and creativity. This transformation goes beyond automation, it strives to cultivate environments where information flows seamlessly, decisions are data-driven and the horizons of what's possible are consistently expanding.

The Cogs and Wheels - IoT and Smart Manufacturing

The manufacturing landscape is witnessing a metamorphosis with the advent of the Industrial Internet of Things (IIoT), sophisticated sensors, edge computing devices and connected manufacturing setups. With an expected compound annual growth rate (CAGR) exceeding 20% from 2020 to 2025 IIoT implementation in manufacturing in the APAC region is flourishing as companies seek enhanced efficiency and a competitive edge¹.



“IIoT and AI are already part of many advanced manufacturing organisations. I expect the adoption to accelerate as the costs come down as these technologies (including AI) gets democratized and demystified”

Laurence Liew, Director – AI Innovation, AI Singapore and Co-Chair - Commercialization and Innovation Working Group, GPAI

Data from the region vividly showcases this transformation. India, in particular, showcases significant growth with its manufacturing sector forecasted to achieve a valuation of \$1 trillion by 2025¹. In the wider APAC context, the integration of IIoT in manufacturing is expected to reduce expenses by as much as 30%².

Under the Hood - Technological Advancements

These innovations are not just at the hardware level. They signify a paradigm shift towards intelligent manufacturing where every element, from the remotest sensor to the entire production line, communicates seamlessly. The result? A significant leap in operational efficiency, with real-time monitoring and predictive maintenance becoming the new norm.

At the core of the digital revolution reshaping the manufacturing sector lies network connectivity as a component. As factories transform into interconnected ecosystems the smooth integration of Operational Technology (OT) environments becomes essential. This connectivity isn't about devices communicating with each other, it's about establishing a responsive network that supports all aspects of manufacturing operations.

The Nerve Center? Network Connectivity

At the heart of the transformation revolutionizing the manufacturing sector lies the aspect element of network connectivity. As factories transform into interconnected ecosystems integrating Operational Technology (OT) environments smoothly becomes essential. This connectivity isn't about devices communicating with each other, it's about establishing a responsive network that supports all facets of manufacturing operations.

Machine-to-Machine Communication has surfaced as a cornerstone for operational efficiency, manufacturers can automate tasks minimize errors and streamline operations. This seamless interaction allows for synchronization and coordination which was previously challenging to achieve.

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“ Real-time monitoring emerges as a cornerstone of this paradigm shift, wherein IoT devices outfitted with sensors continuously gather data on various facets of production. From machine performance metrics to environmental conditions, this data deluge provides invaluable insights into the inner workings of the manufacturing process ”

Udit Pahwa, Group CIO at Kirloskar Management Services.

Recent data highlights the impact of network connectivity. A study revealed that manufacturers in the APAC region who leverage reliable networks saw productivity gains of up to 30%. Moreover, implementing cutting-edge network technologies resulted in a 25% decrease in downtime for factories demonstrating the advantages of these advancements³.

The Tenets of Futuristic Transformation

As we delve deeper into the fabric of connected manufacturing, 5 tenets emerge as transformative agents.

Smart Campuses and Secure Onboarding

Initiatives like **Smart Campuses and Secure Onboarding** are transforming manufacturing facilities into ecosystems. These smart campuses integrate IoT devices, edge computing systems and AI analytics to establish a cohesive and secure environment. Secure onboarding ensures that every device and user is authenticated, protecting network integrity and fortifying defences against cyber threats.

Nex-Gen Wi-Fi standards

The advent of **Wi-Fi 6, 6E and 7** represents a significant leap in connectivity. These innovations bring higher data speeds, increased capacity and better energy efficiency, making them well-suited for dense industrial environments with multiple devices needing to connect simultaneously.

AI-Driven Cloud Remote Radio Management (AI RRM)

This emerges as a tool that simplifies the process of handling radio frequencies in bustling industrial environments. By utilizing AI manufacturers can establish communication routes between devices minimizing interference and enhancing network stability.

Converged Network Management (CNM)

CNM represents a strategic tactic for integrating various network components into a unified platform. This convergence streamlines management processes, enhances security measures and boosts performance across the manufacturing network.

Network as a Service (NaaS)

The integration of **Network as a Service (NaaS)** in the manufacturing industry provides flexibility and scalability. Through on-demand access to network services, manufacturers can adapt to evolving requirements without significant upfront investments in network infrastructure.

Data indicates a growing adoption trend for these technologies. The use of Wi-Fi 6 technology, in the manufacturing sector is becoming popular in India and the Asia Pacific region driven by the growing implementation of Industry 4.0 solutions and the swift industrial development. It is anticipated that the market, for Wi-Fi 6 technology will reach a value of US\$ 51.6 billion by 2030 with the Asia Pacific area expected to lead in revenue generation⁴.

“ Through the seamless transmission enabled by WiFi 6 and WiFi 7, this wealth of data is swiftly relayed to backend systems for analysis, empowering stakeholders with actionable insights into operational performance. Furthermore, the responsiveness afforded by these advanced wireless technologies is instrumental in optimizing manufacturing processes on the fly. Whether it's dynamically adjusting production parameters to minimize downtime or pre-emptively addressing potential quality issues, the ability to swiftly communicate and enact changes in real-time is paramount. With WiFi 6 and WiFi 7, manufacturers can embrace a proactive approach to operational management, ensuring optimal throughput and product quality while mitigating risks of disruptionst ”



Udit Pahwa, Group CIO at Kirloskar Management Services.

A Blueprint for Tomorrow

The integration of these tenets of transformation is poised to revolutionize the manufacturing landscape. These innovations not just aim to streamline operations, but also, lay a strong groundwork for the future of manufacturing.

Embracing Converged Networks and NaaS with AI RRM is like preparing for scalability and adaptability in manufacturing. This viewpoint is echoed by leaders who view these technologies as essential for adapting to rapidly evolving demands at the global level.

As manufacturers increasingly embrace these models backed by next-gen wireless connectivity, the advantages become evident. Converged networks simplify management, boosting efficiency and minimizing errors. Meanwhile, NaaS provides flexibility to adjust operations according to market shifts swiftly enabling manufacturers to stay responsive without being limited by their network infrastructure thus laying the groundwork for futuristic Smart Campuses backed by Secure Onboarding.

“ With huge technology adoption, data silos would be a key question to be addressed along with data privacy and security compliance. With IOT, AI/ML, Digital twin technologies adoption it becomes important to have a single pane of glass for visibility to management for decision making based on intelligent data insights.



CIO's need to adopt such a solution on priority to ensure data integrity for right data insights which would drive business decisions. Also, OEM and product owners need to think of having more open source and flexible API integrations to ensure seamless data flow ”

Mandar Sahasrabudhe, Group CTO at Kirloskar Management Services

The Road Ahead

Looking ahead on this journey towards connected manufacturing reveals both obstacles and opportunities. Challenges like cybersecurity threats, investments in technologies and complexities in merging legacy systems, with modern networks pose significant hurdles.



“Challenges I have personally seen include systems which are older and do not have sensors or IIOT built in, or they have an API, but are proprietary, and would require the customer to pay additional fees to unlock. I think being open and having standards, so that systems from multiple OEMs can ‘talk’ to each other, through established standards would be critical and essential to scale up the adoption of IIOT+AI. This is especially so for the SMEs which would have less resources to get all these interconnected if there are many technical and cost hurdles.”

Laurence Liew, Director – AI Innovation, AI Singapore and Co-Chair - Commercialization and Innovation Working Group, GPAI

However, the benefits far surpass these obstacles. The manufacturing sector is on track to embrace these state-of-the-art technologies driven by a keen focus on innovation. As these technologies advance and become more accessible we can anticipate improvements in efficiency, productivity and sustainability.

“Indian manufacturing is currently at a crucial juncture. It is undergoing a revolution and is poised to become a major contributor to achieving the trillion-dollar mark. In the post-pandemic world, Indian manufacturing is being viewed with hope and confidence. The encouragement from our government is inspiring Indian manufacturers to strive for more and compete with China on the global stage. We are seen as a viable “China plus one” option by the rest of the world. It’s going to be Manufacturing era.”



Looking ahead, technological trends like Edge Computing, 5G, IoT, and AI are set to redefine the next era of manufacturing in India. By preparing our organizations to embrace these changes, we can align with global expectations, contribute significantly to India’s economic goals, and lead the industry towards a bright future”

Milind Khamkar, Group CIO, Supermax

Elevating Smart Manufacturing: The RUCKUS Edge



“In an era marked by economic volatility and talent scarcity, alongside the escalating demands for sustainable innovation, technology emerges as a critical ally for the manufacturing industry. The journey ahead requires a deep commitment to smart factory principles, exploration of the industrial metaverse, and the leveraging of emerging technologies such as generative AI”

Sanjiv Verma, Vice President, Asia Pacific, Japan & China for Ruckus Networks.

As we envisage the future of manufacturing it is imperative to incorporate cutting-edge technology solutions. RUCKUS Networks, a pioneer in high-performance network infrastructure offers a suite of advanced solutions, tailored to the requirements of modern manufacturing environments. Their technology empowers manufacturing facilities with unrivalled connectivity and security. RUCKUS’s Wi-Fi, switching and IoT solutions bolster the efficiency of smart campuses, ensuring seamless operations and exceptional network performance. These tools not just meet the high connectivity demands of dense environments, but also enhance security protocols to safeguard sensitive industrial data. Choosing RUCKUS enables manufacturers to establish a secure, scalable and highly efficient network infrastructure that sets a benchmark for innovation and connectivity in the manufacturing industry. This strategic alignment with leading-edge network solutions is vital for organizations aiming to thrive in an increasingly digitalized and interconnected world.

“Simultaneously, we must focus on driving agility and resilience, emphasizing cost efficiency, and integrating Industrial IoT and advanced automation processes. By focusing on these key areas, we can transform challenges into opportunities and strengthen the manufacturing industry’s foundation against the uncertainties of the future”

Sanjiv Verma, Vice President, Asia Pacific, Japan & China for Ruckus Networks.

In summary, the future of the manufacturing sector is bright, with connected technologies and advanced networks paving the way for extraordinary levels of efficiency, innovation and growth. As the industry progresses incorporating IoT devices, AI-driven management and flexible network services will not only redefine what can be achieved in manufacturing but also, establish new global benchmarks for operational excellence. The genesis of connected manufacturing ushers in a new era of possibilities, powered by the seamless synergy of technology and human inventiveness.

Source

1. Derived from a broader interpretation of the current trends in smart manufacturing adoption within the region.
2. Asia IoT Business Platform
3. GSMA's Mobile Economy Asia Pacific 2023 report
4. Coherent Market Insights – WiFi 6 Technology Market Analysis

