Industrial metaverse and its impact in manufacturing

In recent times, the metaverse has gained much traction and become a topic of boardroom conversation. Though the metaverse has mostly been associated with entertainment and gaming, many of its use cases are also emerging in the manufacturing sector.

Industrial metaverse blends the digital and physical worlds by providing a digital representation of the physical manufacturing environment – such as factories, supply chains and processes. It can thus be leveraged to enable an immersive, collaborative and spatially-aware context within the industrial environment. Technologies powering the industrial metaverse – digital twins, artificial intelligence and machine learning, extended reality, blockchain, and cloud and edge computing – have evolved, allowing for the potential transformation of the manufacturing industry through seamless integration of the digital and physical worlds. This allows stakeholders involved in the manufacturing process to collaborate and simulate possibilities, and enable data-driven decision making in an immersive and interactive virtual environment.

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Let us look at some of the use cases of industrial metaverse in the manufacturing industry.

Factory floor planning and optimisation

One exciting possibility offered by an industrial metaverse is that it will allow the creation of a digital version of the factory floor in the metaverse. This will involve the design and optimisation of the factory floor layout by simulating different layouts, testing operational scenarios, and taking data-driven decisions to enhance efficiency, productivity and safety. All key stakeholders involved in this process will then be able to collaborate effectively, resulting in and faster decision making and better outcomes. Once the simulated plan is executed as is in the physical environment, real-time data can also be obtained via internet of things (IoT) sensors. These sensors can then be used to gain insights into the process, as well as the operational and safety aspects, based on which the factory floor can be continuously optimised to adapt to the changing demands.

Supply chain optimisation

Supply chain is an integral part of manufacturing operations. By leveraging industrial metaverse, digital twin of a supply chain can be created. This will provide a holistic view of the critical aspects of the supply chain process – including suppliers, transportation, warehouses, and distribution. Supply chains can be optimised by ingesting data into the digital twin environment using IoT sensors, RFID tags etc., which will enable one to access updated data and supply patterns on demand and identify any bottlenecks in the process. Moreover, leveraging blockchain technology will enhance traceability and transparency within supply chains. Manufacturers can track and record the movement of goods, capturing information such as origin, manufacturing processes and quality control measures. This will create an immutable and transparent record of product history, enhancing trust and accountability throughout the supply chain.

Employee training

Employee training is another excellent use case in the metaverse. From a manufacturing perspective, immersive training can be provided for employees – realistic simulations of manufacturing processes and scenarios, new equipment familiarisation, safety training, and product and quality training. Employees can try out these simulations and become familiar with the processes in the digital world before performing the activities in the real world, leading to increased productivity, reduction in errors and improved operational efficiency.

Predictive maintenance

Digital twin implementation of factory floors and products allows the generation and mapping of data from various sources, such as IoT sensor data and equipment manufacturing data. This data includes information on equipment performance, operating conditions, temperature, vibrations, and other relevant parameters. By collecting and analysing this data along with historical data, manufacturers can use AI algorithms to identify anomalies and patterns in their operations. Moreover, alerting systems can be enabled, which will send proactive notifications to factory personnel indicating potential downtime of a product or manufacturing line, therefore helping to reduce unplanned outages.

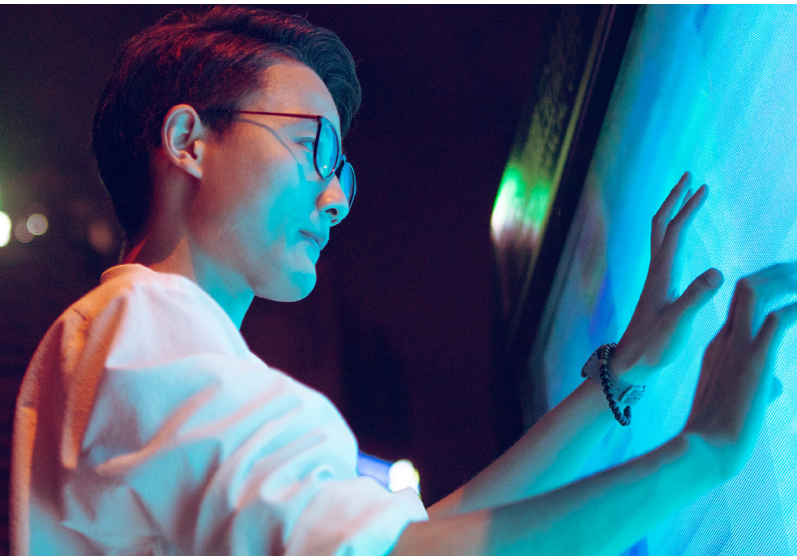
Remote assist

Remote assist allows augmented and virtual reality (AR/VR) devices to provide real-time support to employees in remote locations. There are numerous instances wherein specialists are required to fly in to fix or maintain critical equipment on factory floors. Remote assist allows people at the site to share a live view of the equipment with the expert, who can further help in identifying, troubleshooting and rectifying issues. This is also very useful in delivering expert training sessions on specific manufacturing equipment, empowering on-site engineers to perform their tasks more efficiently.

Product design

Product design is a critical phase in the manufacturing process. Industrial metaverse enables virtual prototyping, allowing designers to create digital representations of products in a virtual environment. With VR and AR technologies, designers can visualise and interact with 3D models, exploring designs from different angles and scales. Furthermore, this way, prototyping can be performed in a collaborative manner with key stakeholders and clients coming together without geographical restrictions. This helps to reduce the number of iterations in the design process and enables faster decision making. The prototype designs can also be simulated in the virtual environment to assess usability and safety, making it more human-friendly.

In conclusion, the industrial metaverse represents a paradigm shift in manufacturing, having immense potential for revolutionising the industry. It has the potential to enhance productivity, improve product quality, streamline supply chain management and drive sustainable practices. As the metaverse continues to evolve, its impact is expected to extend across various aspects of manufacturing, leading to improved operational performance, reduced cost and enhanced customer experience. Embracing industrial metaverse will be an important step for manufacturers in order to stay competitive in the market and gradually become future ready.



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